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FEDERAL NETWORK MANAGEMENT STUDY

INPUT®

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I

Introduction

I

Introduction

INPUT has prepared this report on the federal network management market under agreement with Contel Federal Systems, Incorporated. In planning product and service strategies for this market, Contel must assess the changing requirements for federal wide and local area networks, including technical considerations and agency organization.

Research for this report is primarily based on interviews with various federal government officials and network management product and service vendor representatives. Additional research included analysis of federal contract databases, reviews of the INPUT *Procurement Analysis Report (PAR)*, the *Telecommunications Market Analysis Report (MAR)*, commercial research performed by other INPUT offices, the Office of Management and Budget (OMB) Five-Year Plan, and prominent network management issues in the trade press.

A

Scope

The analysis in this report addresses those areas identified in the custom research agreement between INPUT and Contel Federal Systems, Inc. The report identifies federal network management product and service requirements and analyzes both the technical and organizational environment in that market. The report also examines competitive trends and federal contracting methods over the last four years.

B

Methodology

INPUT used several approaches to gather and analyze the available data, in order to provide this analysis of the federal network management market. For agency and vendor views of the market, INPUT developed questionnaires for interviewing both federal agency officials and network management product and service vendor executives. For federal buying trends and opportunities, INPUT analyzed the most recent agency A-11 submissions as well as the OMB Five-Year Plan for fiscal year 1988.

Federal agency officials selected for interviews included policy executives, datacommunication and telecommunication section heads, communications management specialists, and local area network (LAN) or wide area network (WAN) management specialists. Vendor representatives selected for interviews included division directors and managers, as well as vice presidents of marketing, strategic planning, and business development. Copies of the agency and vendor questionnaires are included in Appendixes B and C.

C

Report Organization

This report is divided into six additional chapters, as listed below:

Chapter II - The Executive Overview summarizes the major points and findings in the report.

Chapter III - The Federal Wide Area Networks section includes discussion of current and future agency WAN requirements. This section also discusses the agency technical, organizational, and procedural environments.

Chapter IV - The Federal Local Area Networks section addresses current and future agency LAN requirements, and prominent vendor presence. Further analysis includes the agency technical environment, and plans and preferences for future LAN acquisitions.

Chapter V - The Vendor Views section covers vendor opinions and attitudes on the agency market, top federal agencies for business opportunities, and future marketing strategies for the network management market.

Chapter VI - The Competitive Analysis section addresses trends in the telecommunication technical support market. This section includes discussion of leading vendors and market shares, vendor performance over the past four years, and comparison of federal procurement methods for technical support.

Chapter VII - The Conclusions and Recommendations section briefly summarizes the results and presents some suggestions on how Contel should proceed.

Several appendixes are also provided:

- Interview Respondent Profiles
- Agency Questionnaire
- Vendor Questionnaire
- Federal Network Management Opportunities listing

II

Executive Overview

II

Executive Overview

Network management represents a key potential area for growth, market penetration, and product development for CONTEL. However, most government and vendor executives do not share a common understanding of what it entails. For example, in a briefing last year, a CONTEL executive defined it this way:

Network management is the planning for, operation of, and administration of local and wide area networks which consist of multivendor voice and data products.

On the other hand, DataPro defines it in a slightly different fashion:

Network management is the control and supervision of the resources that allow communications to take place over the network. It includes ensuring correct network operation, monitoring the use of network resources, maintaining network components in good working order, planning for changes to the network, and producing a variety of information on network operations.

CONTEL is addressing this situation by focusing first on the network profiles and second on the required features and services. In this way, the network management definition issue will become irrelevant.

A

Role of the Network Manager

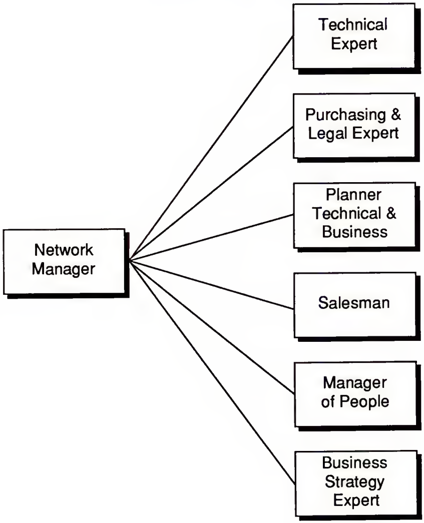
In defining network management, one needs to identify the role of the network manager. Exhibit II-1 summarizes the varied functions the network manager must perform in this complex field:

- A technical expert, to design the network and choose equipment and services that make up the network
- A purchasing and negotiating expert, to implement decisions, since all services and equipment are obtained from other companies

- A technical planner, to ensure that the network does not become obsolete and that it fits the needs of the information system, and a business planner to ensure that the network is managed within budget and schedule constraints
- A salesperson, to convince management and customers that the network is fulfilling their needs
- A people manager, to manage a large telecommunications staff of different skills.

EXHIBIT II-1

ROLE OF THE NETWORK MANAGER



Most important, the network manager must know business strategy since the network is now viewed as a tool to implement business strategy and as a source of business advantages. In performing the functions, the network manager needs multifaceted vendor assistance.

B

Agency WAN Environment

Agencies use a wide variety of host computers to serve as hosts for their Wide Area Network (WANs). The market is dominated by IBM, DEC, CDC, Hewlett-Packard, and Unisys. Other vendors mentioned in the INPUT survey include Amdahl, Prime, Sun, Wang, and Plexus.

Digital Equipment Corporation has penetrated the federal network host market far more than any other vendor. Although more agencies use IBM hosts, Digital has nearly five times as many computers per host as IBM. This reflects Digital's profound penetration of the federal midsize computer market. In a separate market study, INPUT found that Digital controls just over half of this market.

On average, agencies reported the following numbers of terminals connected to host computers:

- Local: 1322
- Remote: 2062
- Both: 1480

These large numbers suggest a significant if not fully appreciated need to manage this network.

Although only 40% of the agencies specified the types of network control centers they used, each noted an average of two types (Exhibit II-2). The most frequently used was IBM Netview, along with various T1 and modem control systems. Other possibilities received limited mention.

C

Agency Planned Upgrades

INPUT asked agencies about any upgrades they were planning for their WANs.

One-quarter of the agencies did not respond to this question (see Exhibit II-3). Of those who did, 15% indicated they would not be upgrading. The upgrade that most agencies will be considering is the FTS 2000. An upgrade to packet switching was ranked second, with T1 as the third upgrade being considered by agencies. Use of ISDN local switches ranked last by respondent agencies.

In a commercial study, INPUT asked network managers about their plans for the future. In one response, these managers indicated that they expect most costs to increase. Although problem management costs will likely remain constant, other costs are expected to rise steadily.

EXHIBIT II-2

NETWORK CONTROL CENTERS IN USE

Network Control Center	Percent of Respondents*	Vendor
IBM NETVIEW	50.0	IBM, TELENET
Modem Control Systems	37.5	DEC, DATACOMM Management Services, DYNATECH
T1 Control Systems	50.0	TELENET, Digital Spectrum, Avanti, Infotron
Wang Network Control	12.5	Wang
Tymnet Network Control	12.5	Tymnet
Paradyne PIX	12.5	Paradyne

Note: 60% of the respondents did not respond to question.

*Multiple responses were allowed; 1.75 responses/respondent.

EXHIBIT II-3

PLANNED UPGRADES BY AGENCY

Upgrades Considered	Percent*
FTS 2000	42
Packed-Switched	26
T1	21
ISDN Local Switch	11

* Based on frequency of mention by respondents.

15% of the respondents indicated no upgrades were planned.

25% of all respondents did not answer question

In the same commercial study, users identified their requirements in the network management area. Generally, users do not have a good understanding of what they need regarding network management products and/ or services. This is due in part to a lack of understanding of what is, or could be, available. It is attributable in even greater part to the continuous urgency of their everyday activities and the resulting lack of time to step back and examine their real requirements.

D

Agency Product Needs

Agencies were asked to rate the importance of selected network management features to operate their WAN environments. The responses have been ranked based on averages of their ratings as seen in Exhibit II-4. The use of expert systems as a diagnostic tool was most important to respondents. This is consistent with other INPUT studies, which show growing federal interest in various forms of artificial intelligence. The desire for single terminal control of the entire network was ranked second, as this will enable agencies to exercise greater control over their systems. Next, agencies ranked the ability to display graphically the status of the entire network configuration. Network management utilities and natural language user interfaces were of least importance to the sample.

EXHIBIT II-4

AGENCY RANKING OF IMPORTANCE OF NETWORK MANAGEMENT FEATURES

Features	Rank*
Expert System Diagnostic Tools for Solving Common Network Problems	1
Single-Terminal Control of Entire Integrated Network.	2
Graphics Display of Network Configuration Status	3
Network Management Utilities	4
Natural Language User Interface	5

*Rank based on respondents' ratings, where 1 = highest.

By comparison, in a separate INPUT study, commercial users identified six product needs and requirements:

- Training, including both self-training materials and built-in training guides
- Network management tools which are easy to learn and use and also recognize multivendor environments
- Disaster recovery plans that are both understandable and readily implemented
- Various carrier services, including management reports, multivendor connects, and private line backups
- Vendor support, including multivendor environments and a full range of support services for small users
- Equipment that is simple to learn and use, and that has the ability to accommodate remote diagnostics

As federal network management becomes more common, these products and services will likely become critical.

E

Agency LAN Environment

INPUT asked agencies about the LAN protocols under which they operate. The establishment of LAN protocols is primarily the result of the standards body of the Institute for Electrical and Electronics Engineers' (IEEE) Project 802. Therefore, most standard LANs are identified in the IEEE 802.x series. Exhibit II-5 identifies the LAN protocol characteristics from the agency respondents for the major IEEE protocols as well as additional protocols mentioned.

The majority of the respondents (77.8%) are classified as utilizing the IEEE 802.3 protocol or the Ethernet standard for their LANs. Ethernet was the first widely available LAN standard jointly published by Digital Equipment, Intel Corporation, and Xerox. Respondents reported averaging 28.7 LANs under the IEEE 802.3 category.

The next largest cluster of respondents are in the "other" category. Fifty-five percent of the respondents, with an average of 62 LANs at their organization, are grouped as employing another type of protocol outside of IEEE. The "other" responses include defense-oriented protocols and proprietary protocols cited by respondents. Wangnet was the only proprietary protocol frequently mentioned and accounted for 11% of the respondents.

EXHIBIT II-5

LAN PROTOCOL CHARACTERISTICS

Protocols	Percent of Respondents*	Average Number of LANs
IEEE 802.3 - Ethernet	77.8	28.7
IEEE 802.4 - Token Bus	11.1	N/A
IEEE 802.5 - Token Ring	16.7	24
Wangnet	11.1	N/A
Other	55.6	62.2

*Does not add to 100% due to multiple responses.

INPUT also asked agencies about the characteristics of their LAN topology. Three-fourths of the respondents from these agencies specified the bus topology again with Ethernet being one of the most popular. The star topology is in place at 25% of the respondents' LANs, while the ring topology accounts for 18.8% of the LANs. These varied protocols and topologies suggest a need to offer a wide range of products and services, as well as a need to accommodate multivendor environments.

In connection with the LAN environment, INPUT also inquired as to whether federal LANs were interconnected, either to other LANs or to WANs.

Fifty percent of the respondents have LAN to LAN interconnects, while 65% have connections between LANs and WANs. Fifteen percent of the agencies have plans for additional interconnections and another 15% have plans for a first time interconnection. Connectivity is important to the federal government in its efforts to achieve greater productivity and efficiency through their LANs.

F

Agency LAN Requirements

Unlike the WAN requirements, most agency respondents had a clearer idea of the role LANs would play in their day to day operations. As a result, the requirements appeared to be somewhat more focused. Office systems represent the most widespread applications in the federal government. LANs can sharply reduce the need for paper in federal offices by circulating most information via terminal. Early this year, the General Services Administration's (GSA) Federal Office Automation Support Center (FOAC) held a conference for federal LAN experts. The participants, representing sixty federal organizations, indicated that establishing requirements and designing the network are the areas representing the biggest problems. The other areas mentioned most often included procurement, installation, and maintenance. In INPUT's survey, 35% of the respondents indicated that the agency did have a requirement for a LAN design tool, while 55% did not have such a requirement.

In a related question, respondents that specified having a requirement were queried as to which features the LAN design tool should incorporate. As shown in Exhibit II-6 all respondents agreed that the design tool should include modeling and simulation and also a logical topology. Eighty percent held the view that it should also include physical cabling design and cost estimate modeling capabilities.

EXHIBIT II-6

SELECTIVE FEATURES FOR LAN DESIGN TOOL

Feature	Percent of Respondents*
Modeling and Simulation	100.0
Logical Topology	100.0
Physical Cabling Design	80.0
Cost Estimate	80.0

*Only 25% of the sample answered question.

Passage of the Computer Security Act of 1988 is expected to have some effect on federal LANs. The National Security Agency's (NSA) National Computer Security Center has recently approved the designs of two multilevel secure LANs. They are expected to be available to agencies in 1990.

Recently, INPUT investigated various announced LAN acquisitions or upgrades at major federal agencies. INPUT identified 13 programs, valued at $409 million, in defense agencies. However, INPUT identified 21 programs in the civilian side of government, valued at $475 million. This is consistent with INPUT's overall findings of more information system opportunities, with more spending, by civilian agencies. In general, there tend to be more numerous but smaller opportunities in civilian agencies. Defense, on the other hand, favors multipurpose umbrella contracts, which tend to run longer and become oversubscribed.

G

Vendor Views of Agency Opportunities

Most vendors responding to the survey agreed with the above assessment. INPUT asked vendors which agencies offered the best network management opportunities, and the results are shown in Exhibit II-7.

EXHIBIT II-7

VENDORS' VIEWS OF AGENCY OPPORTUNITIES FOR NETWORK MANAGEMENT CONTRACTS IN THE NEXT FIVE YEARS

Civilian Agencies	Defense Agencies
General Services Administration	None Mentioned
Veterans Administration	
Department of State	
Social Security Administration	

It is interesting to note that the respondents did not cite any defense agencies. This may be due to the existing defense telecommunications networks already being awarded or bid on only by major prime contractors to the federal government. Another reason for this lack of mention might be that vendors are anticipating cut-backs in procurements from the defense agencies.

A third reason may relate to the comments made at the end of the previous section. Vendors perceive civilian opportunities as wider and defense opportunities as deeper, i.e., more heavily funded.

The civilian agencies which were identified included the General Services Administration, Veterans Administration, Department of State, and the Social Security Administration. These agencies have all publicly announced plans to expand or modernize their telecommunication systems. Possibly other smaller civilian agencies may do so in the future if budgetary constraints are overcome.

H

Conclusions and Recommendations

The federal market for network management products and services is ambiguous, volatile, and not easily sized. Many agencies have a wide variety of networks and network management needs. However, the large number of network marketing opportunities represents a more significant factor for Contel's planning.

As more local and wide area networks are introduced into agency environments, demand for network management services must necessarily increase. Further, as has been shown in numerous studies, the federal customer is steadily growing more sophisticated and demanding. This, too, will lead to steady market growth.

However, agency interviews did not show a highly focused set of requirements. Respondents know that they need help, but they are not sure what form that assistance should take. Accordingly, Contel must first develop or acquire high quality products or services. Then Contel should lead the federal market through journal articles, public forums, and other marketing approaches. Where Contel already has an agency presence, it can introduce the new products and services to its customers.

Contel needs to adopt a three-pronged approach to building network management business:

- Develop a wide variety of products and services, to facilitate flexible reaction to changing federal needs
- Initiate a marketing, as opposed to sales, program to create demand among federal customers
- Identify appropriate teaming partners

In conclusion, INPUT determined that federal network management will continue to be a highly complex, demanding, but growing market. Numerous opportunities exist, whereby relatively small network management efforts can lead to large, comprehensive, telecommunications technical support contracts. The obstacles cited above, if not properly addressed, may preclude Contel from playing a leadership role in this market. Contel needs to take the appropriate steps in marketing, teaming, and product development in order to advance to a dominate position.

III

Federal Wide Area Networks

III

Federal Wide Area Networks

This chapter focuses on wide area networks (WANs) in the federal government. It covers both the technical and organizational environments for WANs, as well as agency plans and preferences.

A

Agency Technical Environment

INPUT asked agencies about the computers they are using in connection with their WANs.

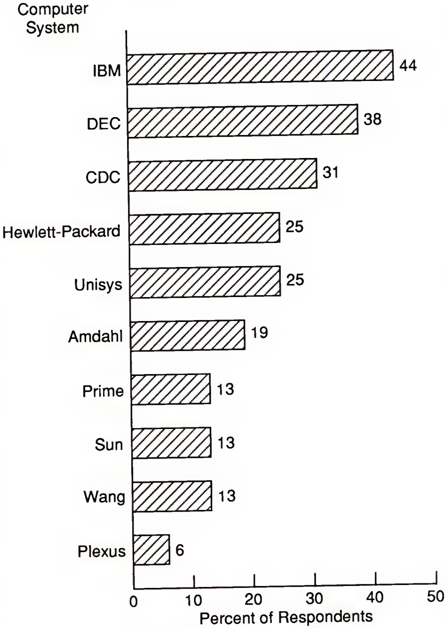
The computers serving as host hardware in support of agency WANs were primarily from the major hardware manufacturers, as shown in Exhibit III-1. IBM systems were mentioned the most frequently by respondents, with DEC following closely. Each agency averaged using more than two brands of equipment as hosts. An average of sixty hosts supported each WAN.

Even though IBM equipment was cited most frequently by respondents, the actual number of DEC hosts was five times higher than the number of IBM CPUs (see Exhibit III-2). This indicates that while IBM's penetration is slightly broader, Digital's penetration runs much deeper. Thus, Digital has achieved far greater success at providing networking computers. CDC equipment was mentioned by 31% of the respondents as hosts, but again the average number of CPUs was low, only 2.3 per WAN. When agencies chose large capacity hosts, such as IBM and CDC mainframes, fewer machines were needed to support WAN environments. Conversely, if smaller machines were selected as hosts, such as some types of equipment available from DEC, more machines were required.

WAN users identified one of two, or a combination of terminal connection methods to their host CPUs. Exhibit III-3 depicts the average number of terminals connected locally, remotely, or employing both methods. Remote connection of terminals appears to be most preferred by agencies for WAN environments, as might be expected.

EXHIBIT III-1

HOST COMPUTERS INSTALLED AT FEDERAL AGENCIES IN SUPPORT OF WANS



Note: Average number of vendor products per site: 2.25.

Average number of hosts per site: 60.1.

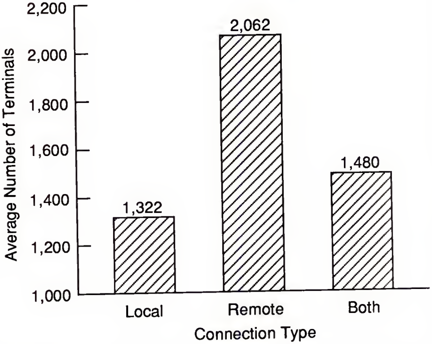
EXHIBIT III-2

AVERAGE NUMBER OF HOST COMPUTERS FOR TOP FIVE MANUFACTURERS

Manufacturer	Average per Respondent
IBM	12.8
DEC	62.8
CDC	2.3
Hewlett-Packard	3.7
Unisys	5.5

EXHIBIT III-3

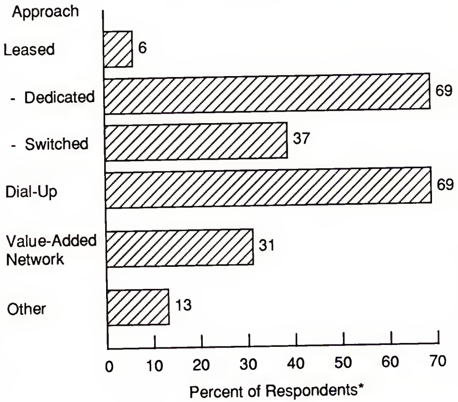
AVERAGE NUMBER OF TERMINALS CONNECTED TO HOST COMPUTERS



Agencies that connected their terminals remotely in WAN environments used more than one connection approach as depicted in Exhibit III-4. Both dial-up and dedicated leased lines were cited with the same frequency. Switched leased lines were used for WAN connections by almost 40% of the respondents, and value added networks by 30%. The high response level for various approaches indicates their continuing viability.

EXHIBIT III-4

REMOTE CONNECTION APPROACHES



*Percents do not add to 100 due to multiple responses.

Respondents who operate dedicated data networks also usually selected more than one network type to connect WANs as demonstrated by their multiple responses in Exhibit III-5. Both IBM's SNA, and DECNET had the highest frequency of mentions, and also had the highest number of lines in use. This is consistent with the firms' equipment dominance, as indicated in Exhibit III-1. It must be noted, however, that many of the respondents were unable to specify the number of lines utilized for each dedicated data network in operation. Many agency officials just do not know how many lines they use.

EXHIBIT III-5

DEDICATED DATA NETWORKS IN USE

Network(s)	Percent of Respondents	Total Number of Lines
IBM/SNA	27.3	3,067
Sperry Uniscope	9.1	150
Burroughs Poll Select	18.2	2,575
DECNET	27.3	2,900
WANGNET	18.2	272
CDC LIP Link	18.2	40
Prime	9.1	20
DDC/MP Ethernet	9.1	Unknown
DDN	9.1	Unknown
GEONET	9.1	Unknown
ITX	9.1	Unknown
MILNET	9.1	Unknown
T1	9.1	Unknown
UB/Net One	9.1	Unknown

In their WAN environments, respondent agencies indicated that an average of 65% of their terminals accessed a dedicated host CPU (see Exhibit III-6). In Exhibit III-7, the relationship between the percent of terminals accessing a dedicated host by number of respondents is depicted. The chart shows that 46% of the respondent sample had 100% of their terminals accessing dedicated hosts. Slightly over one-third had under 40% using a dedicated host processor. This suggests that most agencies focus on one approach or the other, but not both.

Data communications equipment employed by agencies for their WAN environments could not be aggregated to be vendor specific. As shown in Exhibit III-8, only one vendor, Hayes, received multiple mentions for supplying modems. Multiplexors, modems, and T1s from various vendors were used by agency respondents. Only Gandalf was identified as supplying data switches by one respondent. No single vendor was specified for furnishing X.25 pads and converters. This wide diversity in

EXHIBIT III-6

PERCENT OF TERMINALS ACCESSING A DEDICATED HOST

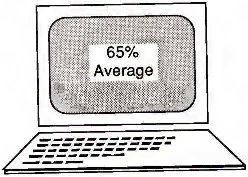


EXHIBIT III-7

PERCENT OF TERMINALS ACCESSING A DEDICATED HOST BY PERCENT OF RESPONDENTS

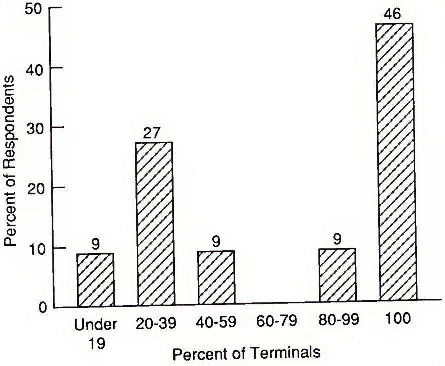


EXHIBIT III-8

DATA COMMUNICATIONS EQUIPMENT USED

Vendors	Equipment Type					
	Modem	Multiplexor	X.25 Pads	Converters	Data Switches	T1
Amdahl		X				
AT&T	X					
Avanti						X
Bridge						X
Codex	X	X				
Gandalf	X				X	
Government-Owned						
Hayes	Ⓧ					
Infotron		X				X
Kodak		X				
MICOM		X				
Paradyne	X	X				
Penril	X					
Racal-Milgo	X	X				
Spectrum-Digital						X
Wang		X				
Unspecified	X	X	X	X		

○ = Equipment type that received multiple mentions.

responses not only suggests that no vendor dominates this market, but also that agencies perceive little advantage to any particular brand (except possibly for Hayes).

In a related commercial study, INPUT found fairly well defined criteria for network segmentation. Most networks are functionally, and often physically segmented. In most cases the rationale for the segmentation is

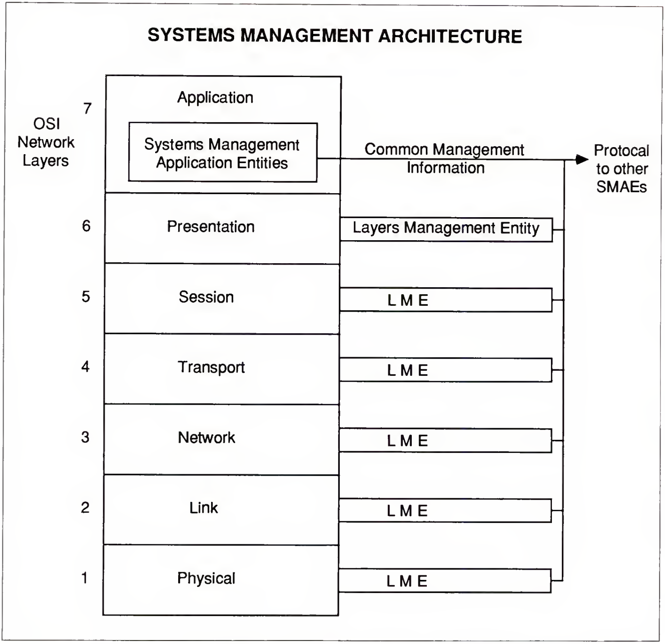
related to the business operations of the organization. Whatever the reason for the segmentation, it invariably forms the basis for the structure of the organization that manages the network.

- Technology—The most common segmentation of networks is on the basis of technology, particularly between voice and data communications. Increasingly, new technologies such as LANs and T-1 networks are becoming distinct and separately managed network segments.
- Geography—Another common segment is that of geography. This segmentation is important because of the logistic requirements of getting people and equipment to remote locations. Large retail operations are frequently segmented geographically to conform to their geographic distribution of business responsibility.
- Line of business—A more critical segmentation is that of the business operations of the user organization. Divisions of multi-industry firms are often decentralized in their management structures and their communication networks follow the management structure, at least to some degree.
- Application—Ultimately, each network operation is organized around a specific application. For example, in the airline industry the reservation networks are separate from the regular operating networks of the firm.

The broader subject of multinetwork, multivendor management of user networks is a much more critical function for most users, in both the government and private sector.

- OSI NM Standards—International standards organizations are in the process of developing a set of standards for the management of user networks. This work is expected to be visible in network management products in about two years. The standards work is closely following the pattern set by the OSI network model with its layered structure. As shown in Exhibit III-9, there are Layer Management Elements at each of the seven defined layers of the OSI model. The controlling element is a set of management functions (Systems Management Application Elements) operating in the application layer and a communication protocol (Common Management Information Protocol) enabling the interconnection of these elements.
- Vendor standards—Numerous vendors have established network management concepts or architectures of their own. This is partly in response to user needs and the lack of an in-place OSI standard. It is also in response to the vendors' need to protect their own product lines in the face of the clear trend toward multivendor networks.

EXHIBIT III-9



The earliest of these vendor standards was set primarily by the modem vendors, including AT&T. These early network management systems used the increased intelligence of modems to monitor lines as well as their own operations and then transmit the information over a secondary channel on the same circuit to a central monitoring system. Due to the unique nature of the information transfer protocols on these secondary channels, the systems were only capable of operating with their own modems.

In some cases "wraparound" boxes were used to bridge both sides of other vendors' equipment to provide the same information. These devices never found a significant market.

B

Agency Organizational Environment

The organization within agencies responsible for control of WAN environments was most often located within data processing, or in a separate telecommunications group (see Exhibit III-10). Only a small percentage of respondents cited a user organization as controlling their WAN networks. This is to be expected in the federal environment, since federal policies discourage user control of agency facilities.

EXHIBIT III-10

ORGANIZATIONAL CONTROL OF NETWORK(S)

Organization	Percent of Respondents
Data Processing	56.3
Separate Telecommunications	37.5
User	6.3

Note: 20% of all respondents did not answer question.

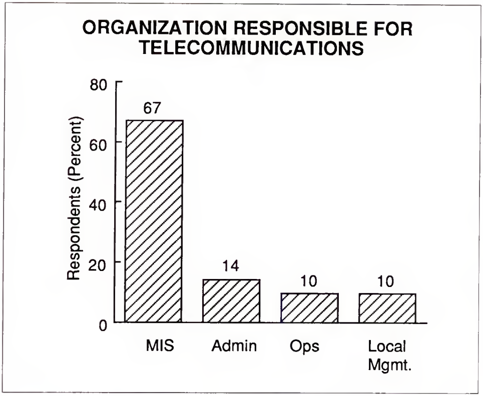
By comparison the commercial market for network management is organized in a somewhat similar fashion (Exhibit III-11). In general, telecommunications is increasingly the responsibility of the information systems organization, just as in the federal environment.

Deviations from this pattern are due to one of two reasons. First, voice is still handled within an administration department; second, telecommunications is a distributed responsibility with each plant or division handling its own telecommunications.

Staffing is more often a budget problem than a people problem in the private sector. People are usually available, but the network management budget may be almost an afterthought.

Although budgeting for network management staff is frequently a problem in many organizations (at least until a major network failure occurs), there is no shortage of qualified people available today. Many of the people laid off at AT&T and other vendor organizations are well trained in areas directly or closely related to network management.

EXHIBIT III-11



C

Agency Procedural Environment

Most agencies recognize the need for network security measures to protect access to their WAN networks. Security issues are more critical in larger geographical areas, and when data is swapped among different computer systems. LAN environments do not normally require sophisticated systems protection. However, the Computer Security Act of 1988 has heightened security awareness in this area also.

All respondents with WANS employed some form of a security method as listed in Exhibit III-12. Half of the agencies were taking advantage of sophisticated, although expensive security measures. Close to one-third were using dial-back units, and 20% operated encryption devices. Forty percent indicated various vendor provided packages, although no vendor emerged as a leader in this area.

Although only 40% of the agencies specified the types of network control centers they used, each noted an average of two types. The most frequently used were IBM NETVIEW, and various T1 and modem control systems (see Exhibit III-13). Other possibilities received limited mention.

EXHIBIT III-12

NETWORK SECURITY METHODS

Methods	Percent of Responses*	Vendors
Vendor-Provided Security Package	40	Prime, Burroughs, Telenet, Wang, DEC
Encryption Device	20	AT&T, NSA
Dial-Back Unit	27	Digital Pathways, Various
Connection Servers	7	Unspecified
Passwords	7	N/A

*Does not add to 100% due to rounding.

EXHIBIT III-13

NETWORK CONTROL CENTERS IN USE

Network Control Center	Percent of Respondents*	Vendor
IBM NETVIEW	50.0	IBM, TELENET
Modem Control Systems	37.5	DEC, DATACOMM Management Services, DYNATECH
T1 Control Systems	50.0	TELENET, Digital Spectrum, Avanti, Infotron
Wang Network Control	12.5	Wang
Tymnet Network Control	12.5	Tymnet
Paradyne PIX	12.5	Paradyne

Note: 60% of the respondents did not respond to question.

*Multiple responses were allowed; 1.75 responses/respondent.

Differences were reported by respondents between those who operate and those who provide other support to agencies' WANs, as shown in Exhibit III-14. It is also evident that a few agencies used more than one type of a solution to operate and service their WANs due to multiple responses by the agencies. In general, most agencies appear more comfortable operating their WANs than servicing them.

EXHIBIT III-14

NETWORK SUPPORT*

A. Operation of Network

Type of Operation	Percent of Respondents**
In-House	66.7
Single-Vendor	20.0
Multiple-Vendors	20.0

B. Service of Network

Type of Service	Percent of Respondents**
In-House	33.3
Single-Vendor	53.3
Multiple-Vendors	33.3

*25% of all respondents did not answer question.

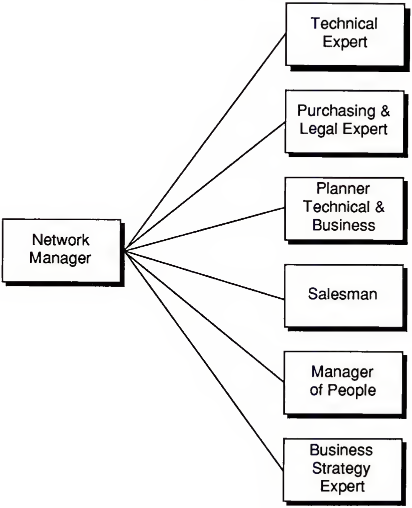
**Percent does not add to 100 due to multiple responses.

Two-thirds operated their WANs employing their own in-house personnel, and one-third provided in-house support services. Agencies contracted for a single vendor or multiple vendors to provide operational support functions with equal frequency, whereas single vendors provided over 50% of the actual servicing of agency WANs.

In a commercial study, INPUT asked companies what functions the network manager typically performs. Exhibit III-15 summarizes the functions performed in this complex field.

EXHIBIT III-15

ROLE OF THE NETWORK MANAGER



A network manager must be:

- A technical expert to design the network and choose equipment and services that make up the network
- A purchasing and negotiating expert to implement decisions, since all services and equipment are obtained from other companies
- A technical planner to ensure that the network does not become obsolete and that it fits the needs of the information system, and a business planner to ensure that the network is managed within budget and schedule constraints

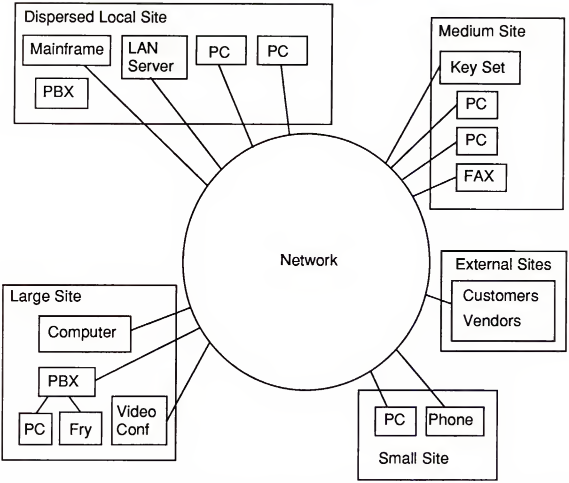
- A salesperson to convince management and customers that the network is fulfilling their needs
- A people manager to manage a large telecommunications staff of different skills
- A business strategist, since the network is now viewed as a tool to implement business strategy and as a source of business advantages.

Despite institutional differences, most of these functions apply to the federal environment as well. The network is viewed differently by its developers and managers and by the people who must use the network.

Users of the network consider it "something that fulfills their needs to get information from one place to another." Exhibit III-16 illustrates this point of view.

EXHIBIT III-16

NETWORK DEFINITION FROM THE OUTSIDE



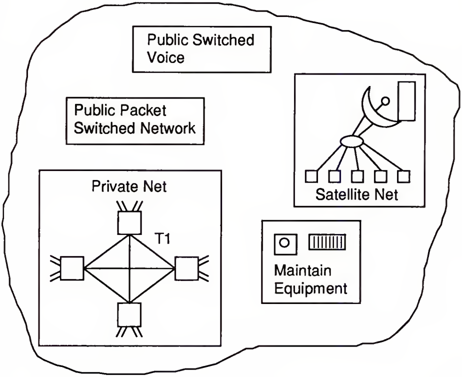
Large sites contain computers that usually access the network directly, and a PBX that connects telephones, FAX units, etc. to the network. Although federal FAX usage trails that of the private sector, its popularity is now growing sharply. The high bandwidth of video conferencing usually requires a direct connection.

- Small sites and medium sites may have the PCs and FAX units connect directly to the network, while telephones use a key system for access.
- There are also many geographically dispersed local sites where LANs use the network for local communication.
- The network must connect to external networks to reach customers and suppliers.
- The people at all of these different sites don't really care about what is in the network. They look at it as sort of a "large black box" without any actual visibility of the contents.

Exhibit III-17 is the telecommunication department's view of the network.

EXHIBIT III-17

NETWORK FROM THE INSIDE



There is complete visibility of the insides of the network. However, the network itself can consist of other internal subnetworks with less visibility, for example:

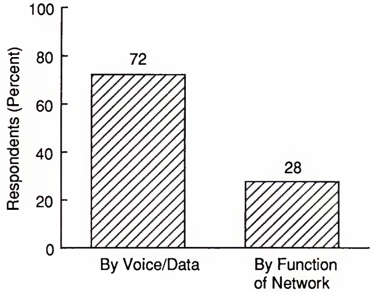
- Satellite networks can be obtained as a service or turnkey.
- Public networks such as packet switching and the Direct Distance Dialing (DDD) system are used as part of the overall corporate network.
- Private networks are used where they are appropriate.

Network management has the tasks of reconciling these two very different viewpoints (users of information systems (IS) and telecommunications managers) of the network world. It is not a simple task.

Although the integration of voice and data is an important issue, few user organizations, at least in the private sector, are truly set up to handle such a task. Most network management organizations report, directly or ultimately, to the head of information systems, but the functions of network management are still largely allocated according to the traditional voice and data technologies. Exhibit III-18 shows the fraction of user organizations where the basic division of responsibility was divided along voice versus data lines as opposed to some other, typically functional, division (such as sales or manufacturing).

EXHIBIT III-18

ALLOCATION OF RESPONSIBILITIES



Organization of Network Management

In those organizations where the voice function is still part of an administration group, the voice/data division is even more distinct. Nevertheless, the voice/data issue is not a burning question in most user organizations.

D

Agency Plans and Preferences

Agencies were asked to rate the importance of selected network management features to operate their WAN environments. The responses have been ranked based on averages of their ratings as seen in Exhibit III-19. The use of expert systems as a diagnostic tool was most important to respondents. This is consistent with other INPUT studies, which show growing federal interest in various forms of artificial intelligence. The desire for single terminal control of the entire network was ranked second, as this will enable agencies to exercise greater control over their systems. Next, agencies ranked the ability to display graphically the status of the entire network configuration. Network management utilities and natural language user interfaces were of least importance to the sample.

EXHIBIT III-19

AGENCY RANKING OF IMPORTANCE OF NETWORK MANAGEMENT FEATURES

Features	Rank*
Expert System Diagnostic Tools for Solving Common Network Problems	1
Single-Terminal Control of Entire Integrated Network.	2
Graphics Display of Network Configuration Status	3
Network Management Utilities	4
Natural Language User Interface	5

*Rank based on respondents' ratings, where 1 = highest.

One-quarter of the agencies did not respond to the question on planned upgrades to their existing WANS (see Exhibit III-20). Of those who did, 15% indicated they would not be upgrading. The upgrade that most agencies will be considering is to utilize FTS 2000. An upgrade to packet switched was ranked second, with T1 being the third upgrade being considered by agencies. Use of ISDN local switches ranked last by respondent agencies.

EXHIBIT III-20

PLANNED UPGRADES BY AGENCY

Upgrades Considered	Percent*
FTS 2000	42
Packed-Switched	26
T1	21
ISDN Local Switch	11

*Based on frequency of mention by respondents.

15% of the respondents indicated no upgrades were planned.

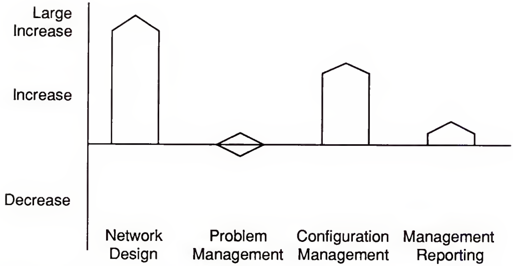
25% of all respondents did not answer question.

In a commercial study, INPUT asked network managers about their plans for the future. In one response, these managers indicated that they expect most costs to increase (Exhibit III-21). Although problem management costs will likely stay constant, other costs are expected to increase.

In the same commercial study, users identified their requirements in the network management area. Generally, users do not have a good understanding of what they need regarding network management products and/ or services. This is due in part to a lack of understanding of what is, or could be, available. It is attributable in even greater part to the continuous urgency of their everyday activities and the resulting lack of time to step back and examine their real requirements.

EXHIBIT III-21

CHANGING PATTERN OF NETWORK MANAGEMENT EXPENSES



As a result, a common situation in many user organizations is that the decision to purchase many items of network management equipment is made by senior people with less than adequate input from the actual network managers. While this procedure produces a large market for such equipment, the resulting lack of effective users of this equipment creates internal friction and business problems for users, as well as bad publicity for vendors.

In fact, users have a wide range of requirements for network management aids. Many of these needs can be addressed by increased intelligence in network management equipment and by increased interoperability of this equipment. More of these needs are of the kind which will only be addressed by a greater number of better-trained network management personnel.

Usability

The largest problem facing network managers is the broad issue of usability. Users already have a wide variety of tools available with which to manage their networks, but in a high percentage of cases they are either unable to use these tools or use them ineffectively. There are three basic reasons for this lack of usability.

First, the users have not been sufficiently trained in the use of the available tools. Second, the use of the tools is often very complex and difficult to understand. Third, none of the tools available addresses more than only a limited set of network problems.

A good example of all of these reasons is IBM's Netview product line, and its predecessors NCCF, NPDA, and others. There are more than 3,000 installations of Netview at present. All of these are, by definition, within the computer room. Very few telecommunications network managers are trained in Netview, or , for that matter, much of anything that goes on inside the computer.

Large companies are notable exceptions to this generalization. However, there are many more installations of Netview than there are large companies.

The other dimension of the Netview example is that although Netview is potentially a very powerful tool, it is most powerful when used with IBM's own modems. Few network users, even the large companies, use IBM modems.

This example is not meant as a criticism of Netview. Netview and Netview/PC are closer to being the "universal network manager" than anything else that exists in the marketplace today.

The point is that network managers need and need badly significantly more training and experience to be able to use tools like Netview effectively.

- Training time—Training time is an extremely scarce commodity in all user organizations. The average time spent in training is less then 2% of the total time of network management staffs. As federal budgets are constrained, training is usually the first thing to be cut. Most of the training time that is spent is on-the-job training.

  The formal training that is available to users is either very generic training intended for neophytes or is very specific training on one vendor's product. The lack of available training courses is a chicken-and-egg problem. There are not enough appropriate courses available because there are not enough potential customers to make such courses profitable. There are not enough customers because there are not enough agencies that are prepared to release their network management people for the necessary time.

- Understandability—One of the key impacts of the lack of training is that many network management tools are installed but not used. This is particularly true of network management tools installed on mainframe computers, as mentioned above.

A partial alternative to training is simplification. The use of "idiot lights," while regarded as laughably crude, is, in fact, used very effectively by many users. A typical implementation is the placement of all of the modems in a communications room in such a way that the network manager can see the front panels of all of them from his or her desk. This technique is practical only for small to medium-sized users, precisely where the problem is most acute.

- Experience—Although training and understandability continue to be a major problem, the network managers do develop a very strong capability in "doing what has to be done." This capability involves a wide range of experience-developed procedures, such as who to call, who to trust, what to try, what usually works, and so on. Most of these procedures are kept in a loose leaf notebook or in a network manager's head.

  This is a potential area for artificial intelligence techniques. Some vendors and users (large users) are considering such a path. The growing popularity of artificial intelligence was indicated earlier in this chapter.

- Scope—All of the network management tools available today are extremely limited in the scope of network problems each is capable of addressing. Therefore, many different tools are required.

  This is true in spite of the recent, and highly publicized efforts on the part of network management vendors to provide integrated network management systems. IBM's Netview/PC and AT&T's UNMA are examples of these efforts.

The problem this creates for users is to greatly increase the magnitude of the training and understandability problems already discussed. It also increases the practical problem of physical space and, more important, the need to use multiple, separate devices for the resolution of single problems.

An example of a critical user need for an integrated tool is that of rerouting. In the event of a line failure, the network manager has tools available to reroute the line to another circuit. The manager also has tools to examine the performance impact of additional traffic on that circuit. The ideal situation is to be able to perform a real time (or at least quick) "what if" analysis of a proposed reroute from the same device.

Multivendor

By definition, all network users are faced with a requirement to deal with multiple vendors. At a minimum a user will need to deal with an equipment vendor and a carrier. While the average user deals with about a dozen vendors, some large users obtain network products and services

from over 100 vendors. Contel may choose to take a leadership approach in this area by providing systems integration support for network management.

This situation creates two different network management problems. One is the simple but massive logistical task of knowing which vendor is responsible for each component of the network. The other is the more complex problem of knowing how each of these vendors' products works with the network. Many agencies will resolve this problem with a prime contractor, systems integration approach.

Many network management system vendors are addressing the logistical problem with good quality data base systems. Few are addressing the interworking problem.

Programmability

Programmability is very much a large-user issue. It is only the large users who are equipped or even interested in doing their own programming of network management operations. Most, if not all, of these are large data network users with sophisticated network software.

An interesting battle is occurring between the users of IBM and the Netview product and the users of Cincom and the Netmaster product. While Netview has a much greater market penetration (with some 3,000 installations compared to Netmaster's 700), the Netmaster product is more efficient in both programming ease as well as resource utilization. This battle is constrained to the very largest users, however, and has little impact on the average user.

In its commercial study, INPUT also asked users about product needs and requirements, shown in a general sense in Exhibit III-22.

- Ease-of-use—Training is scant, and the products are complex. It is incumbent upon vendors to solve the users' problems in the use of network management tools and not to wait for some day in the future when the users can do it for themselves.

- Multivendor situations—No product stands by itself. At the very least a communications line is connected to hardware. A large user might have 100 or more vendors. The vendors should make it easy for their equipment and their communications services to fit into this multivendor environment (manuals, training, assistance, etc.)

EXHIBIT III-22

PRODUCT NEEDS AND REQUIREMENTS

- Training
  - Self-Training Materials
  - Built-In Training Guides/Help
- Network Management Tools
  - Integrated Solutions over a Full Range of Problems
  - Multivendor
  - Easy to Use/Learn
- Disaster Recovery
  - Network Services
  - Bypass Central Office
- Services from Carriers
  - Supply Network Usage & Status Information
  - Multivendor Connect to Others
  - Backup for Failed Private Lines and Local Loops
- Support from Vendors of Equipment and Communications Services
  - Multivendor
  - Areas Where the Users Are Weak
  - Smaller Users Full Range of Services
  - Large Users as Needed
- Equipment
  - Simple to Learn and Use
  - Capable of Self-Test and Remote Test and Reconfiguration

Training is a problem in network management. The telecom network management staff is too busy to take the time for training, and as a result they do not know how to use many of their network management tools. This situation hurts the users because the problems for which the tools were obtained have not been solved. It hurts the vendors of these tools because non-use does not result in recommendations to other users or in repeat or add-on sales. Solutions to training problems are:

- Self-training materials, such as computer-based training (CBT) or interactive video disks, will allow the telecom staff to train at their own sites during intervals of free time.

- Built-in training guides, such as "help screens" or even embedded CBT, allow the users to obtain specific help when they need it.

Of course, training only for a specific problem does not give the student an overview of the entire process. Thus, vendors must offer full-length and introductory courses about network management with self-learning materials and conventional instructor-led training.

Network management tools must be designed to fit the real environment, which is complex. Such tools include:

- Tools that recognize the multivendor environment by allowing for a range of communications service and hardware vendors

- Easy-to-use-and-learn tools that place a greater importance on usability, perhaps with fewer functions, than tools with great functionality, at the expense of complexity and support

In addition, integrated solutions are required for a full range of problems. This includes, for example, recommending reconfiguration actions to take when a fault is found. Perhaps the recommendations can be implemented automatically.

Disaster recovery is mentioned by many, but good, solid plans and implementation of these plans are far less prevalent.

Network services that support disaster recovery are required; for example, the ability to bypass failed private lines or a major network node.

Central office failure is possible (witness Hinsdale, Illinois). It is also very possible for all of the local loops to a major node to be cut at once. The local loop bypass solution probably involves satellite or microwave transmission.

Carriers can supply network management services. They should include:

- Network usage and status information used both for short-range corrective actions and for long-range changes in the design of the network

- Recognition of the reality of multivendor environments by supplying information for the full network. It will be necessary to interface to other vendors to do this.

- Backup for failed private lines and local loops. Most likely (especially for local loop backup) the backup will be for different communications vendors' services.

Support is key for any product, especially a complex one and for users in complex situations. At times the support is more important than the product features. Support should consist of aid in the solution of problems and of user training to solve the problems themselves. Requirements are:

- To support multivendor environments—though it is difficult to support other vendor's products, this is needed, and third-party maintenance vendors have shown that it is possible.
- To provide support in areas where the users are weak. For example, a user might not be familiar with VSATs or with data by radio.
- To offer a full range of support service for the smaller user who does not have the depth of knowledge of a large user
- To provide services only as needed for a large user. For example, the need might not be at the headquarters but in a remote geographic region.

Equipment must be designed for the realities of a multivendor environment, for geographical separation, and for relatively untrained users. It must be:

- Simple to learn and user-friendly. This might be an extreme example, but few people have to take a course to learn how to use their refrigerator or stove.
- Capable of self-testing and remote testing to handle the geographical separation problem. Then it should be capable of remote reconfiguration to do something about a problem.

IV

Federal Local Area Networks

IV

Federal Local Area Networks

This chapter covers the federal market for local area networks (LANs). Again, data is presented on market presence, the agency environment, as well as plans and preferences.

A

Presence in Federal Market

Local area networks (LANs) provide federal agencies with cost effective methods of sharing information, promoting the use of electronic mail and more efficient accessibility to shared resources. Ninety percent of the agency respondents stated that they are presently utilizing LANs in their computer operations.

The agencies averaged 66.8 LANs per respondent organization as noted in Exhibit IV-1. Furthermore, since the sample included a variety of protocol types, the average number of LANs for each protocol cited was calculated to be 38.5. This suggests that while some agencies use multiple protocols, most concentrate on only one type to support their LAN needs.

EXHIBIT IV-1

SUMMARY OF LANS AT FEDERAL AGENCIES

	Number of LANs	
	Per Protocol	Per Respondent
Average	38.5	66.8

In identifying future LAN opportunities for the *Telecommunications Market Analysis Report*, INPUT located numerous plans for upgrades or replacements of currently installed LANs. Section C of this chapter contains specific information on some acquisition plans.

Although most agencies require consulting support to install a LAN, this is not always the case. For example, Public Health Service personnel installed their own LAN in the Office of the Assistant Secretary for Health. The network was built around a single 3Com3 + server. The LAN serves 51 users, 6 of which are in remote locations in the metropolitan Washington area. The need for E-mail initially drove the design of the LAN, although it now performs other functions. The office has created the position of network manager, a government employee who performs most of the standard management functions. Should Contel choose to strengthen its LAN management offerings, this network manager would provide a good source for assessing the viability of various products and services.

Federal agency respondents to INPUT questionnaires indicated that no single vendor has a dominant share of the local area network market. As illustrated in exhibit IV-2, 19 vendors were named as LAN hardware suppliers, 11 for LAN software, and 13 for LAN management systems.

EXHIBIT IV-2

LAN VENDORS AT GOVERNMENT AGENCIES*

Hardware	Software	Local-Area Network Management System
CDC	IBM	No Multiple Mentions
DEC	Novell	
IBM	10 NET	
Sun Microsystems	3COM	
3COM	Ungermann-Bass	
Wang		
Total: 19 Vendors Mentioned	Total: 11 Vendors Mentioned	Total: 13 Vendors Mentioned

*Vendors listed received more than one mention.

Of these 43 vendors mentioned, only a handful were mentioned more than once, and in the LAN management category, no vendors received multiple mention. The LAN management vendors which were mentioned included Ungermann-Bass, Digital Communications Associates, Digital Equipment Corp., Novell, Bridge, Inc., Control Data Corp., IBM, and 3Com. In some cases, the same vendor may supply the LAN hardware, software, and LAN management system. Since the LAN management system market is still emerging in government applications, no vendors have achieved market dominance.

B

Agency Technical Environment

Architectures and specifications for LANs include several technical characteristics. The technical features examined in this study include protocols, topologies, cabling types, and data speeds for transmissions. The multiple responses offered from the agency representatives included both the widely established standards and proprietary alternatives available from several vendors serving the federal market.

The establishment of LAN protocols is primarily the result of the standards body of the Institute for Electrical and Electronics Engineers' (IEEE) Project 802. Therefore, most standard LANs are identified in the IEEE 802.x series. Exhibit IV-3 identifies the LAN protocol characteristics from the agency respondents for the major IEEE protocols as well as additional protocols mentioned.

EXHIBIT IV-3

LAN PROTOCOL CHARACTERISTICS

Protocols	Percent of Respondents*	Average Number of LANs
IEEE 802.3 - Ethernet	77.8	28.7
IEEE 802.4 - Token Bus	11.1	N/A
IEEE 802.5 - Token Ring	16.7	24
Wangnet	11.1	N/A
Other	55.6	62.2

*Does not add to 100% due to multiple responses.

The majority of the respondents (77.8%) are classified as utilizing the IEEE 802.3 protocol or the Ethernet standard for their LANs. Ethernet was the first widely available LAN standard jointly published by Digital Equipment, Intel Corporation, and Xerox. Respondents reported averaging 28.7 LANs under the IEEE 802.3 category.

The next largest cluster of respondents are in the "other" category. Fifty-five percent of the respondents, with an average of 62 LANs at their organization, are grouped as employing another type of protocol outside of IEEE.

The "other" responses include defense-oriented protocols and proprietary protocols cited by respondents. Wangnet was the only proprietary protocol frequently mentioned and accounted for 11% of the respondents. One defense agency respondent reported utilizing custom LAN interfacing protocols for the Defense Automated Addressing System (DAAS). Another DoD respondent mentioned a protocol called LAT, or Local Area Transport protocol. Other commercial protocols specifically include Net/One by Ungermann-Bass, Arcnet by Novell, and ATT Starlan proprietary suites.

The IEEE 802.5/Token Ring protocol was cited by a slightly higher portion of respondents (16.7%) than the IEEE 802.4/Token Bus protocol (11.1%). These two technologies are supported by major vendors of the federal marketplace.

LAN topology refers to the shape in which the workstations are arranged throughout any installation. The topology of the LAN is usually not a critical issue to the agency when interconnecting LANs, since most LANs will work on any of the simple topologies (ring, bus, star, or hybrid). Many of the agencies interviewed have installed LANs of different topologies.

Exhibit IV-4 illustrates the LAN topology characteristics of the agencies studied. Three-fourths of the respondents from these agencies specified the bus topology again with Ethernet being one of the most popular protocols. The star topology is in second place at 25% of the respondents LANs, while the ring topology accounts for 18.8% of the LANs.

Exhibit IV-5 summarizes the cabling types or transmission medium for LANs at the federal agencies. The most common response was coaxial cable (76.5%). The coaxial cable is used primarily in conjunction with the bus topology, which accounts for the similar percentage of respondents. The twisted pair accounted for 52.9% of the respondents, while fiber optics was cited by 35.5%. Fiber optics is gaining in usage in the federal government in areas where national security is an important concern.

EXHIBIT IV-4

LAN TOPOLOGY CHARACTERISTICS

Characteristic	Percent of Respondents*
Bus	75.0
Ring	18.8
Star	25.0
Mixed	6.3

*Does not add to 100 due to multiple responses.

EXHIBIT IV-5

LAN CABLING TYPES

Type	Percent of Respondents*
Coaxial Cable	76.5
Twisted Pair	52.9
RS-232	23.5
RS-449	5.9
Fiber-Optic Cabling	35.3
Other	5.9

*Does not add to 100 due to multiple responses.

Respondents were also queried on the data speeds of their LANs. Since the agencies have installed a variety of protocols and include a wide range of complexities for their networks, the data speeds cited varied. However, most respondents cited speeds which are fairly typical for each type of protocol or topology. These include:

• IEEE 802.3 (Ethernet)	10 Mbps Data Speed
• Token Ring	4 Mbps Data Speed
• Token Bus	1.2 Mbps & Above Data Speed

Several respondents were not familiar with the details of their LANs' data speed and could not supply any technical information.

The federal agencies were surveyed as to whether their present LANs were interconnected either to other LANs or to wide area networks (WANs). As shown in Exhibit IV-6, 50% of the respondents have LAN to LAN interconnects, while 65% have connections between LANs and WANs. Fifteen percent of the agencies have plans for additional interconnections and another 15% have plans for a first time interconnection.

EXHIBIT IV-6

LAN CONNECTIVITY

Connectivity Types	Percent of Total Respondents
Current Interconnects	
- LAN to LAN	50
- LAN to WANs	65
Plans for Additional Interconnection	15
Plans for First-Time Interconnect	15

Connectivity is important to the federal government in its efforts to achieve greater productivity and efficiency through their LANs.

For example, the Office of the Secretary of Defense (OSD) is installing a LAN to allow defense offices to share information on large acquisition programs overseen by OSD. The system will consist of 400 workstations connected by fiber optic cable. To enhance connectivity, the workstations will also be able to communicate with more than a thousand workstations in other LAN offices.

However, at this writing, the project is suspended because of protest. The award, for $86 million, was made to Xerox. Contel protested the award, claiming a technically superior proposal. The request for proposal (RFP)

had cited technical excellence and innovation as the most important factors in the procurement. However, since Contel's price exceeded that of Xerox by half a million dollars, the award went to Xerox. At this writing, it is not clear when the matter will be resolved.

C

Agency Plans and Preferences

Agency respondents were asked whether they have a requirement for a LAN design tool. Exhibit IV-7 tabulates the agencies' responses. Thirty-five percent of the respondents indicated that the agency did have a requirement for a LAN design tool, while 55% did not have any requirement.

EXHIBIT IV-7

AGENCY REQUIREMENTS FOR LAN DESIGN TOOLS

Response	Percent with Requirement
Yes	35
No	55
No Answer	10

In a related question, respondents that specified having a requirement were queried as to which features the LAN design tool should incorporate. As shown in Exhibit IV-8, all respondents agreed that the design tool should include modeling and simulation and also a logical topology. Eighty percent held the view that it should also include physical cabling design and cost estimate modeling.

Passage of the Computer Security Act of 1988 is expected to have some effect on federal LANs. The National Security Agency's (NSA) National Computer Security Center has recently approved the designs of two multilevel secure LANs. They are expected to be available to agencies in 1990.

The systems are provided by Verdix and Boeing. Verdix's VSLAN provides a central network security center and up to 64 security cards in the micros, workstations, minis, and mainframes. The units are connected by an Ethernet backbone. The system provides mandatory and discretionary access control, auditing, identification, and authentication capabilities.

EXHIBIT IV-8

SELECTIVE FEATURES FOR LAN DESIGN TOOL

Feature	Percent of Respondents*
Modeling and Simulation	100.0
Logical Topology	100.0
Physical Cabling Design	80.0
Cost Estimate	80.0

*Only 25% of the sample answered question.

Boeing's MLS LAN provides secure network servers connected by a 100 megabit/second fiber optic bus. It controls a mix of up to seven hosts or 56 terminals. Up to eight security levels and 356 discretionary categories may be programmed into MLS LAN.

In connection with the recent update to INPUT's *Telecommunications Market Analysis Report,* INPUT further investigated agency plans in connection with LANs.

The majority of the agencies are currently using or have plans to implement LANs. Several of the agencies procured their LANs locally at each site, and some of the sites have multiple LANs rather than just one. The federal agency users are requiring that more computing power be made available within each work group and across different work groups.

At present, the general data and administrative applications are supported by the LAN services. Within five years the technical and scientific applications will be more developed. The existing LAN networks in the agencies use the Ethernet bus and IBM token ring topologies, which are becoming partial or semi-de facto standards, along with the proprietary networks established by multiple vendors. LAN usage has increased because agencies perceive LANs as highly effective and cost efficient, as compared to the wide area networks. Exhibit IV-9 lists the major local area networks for key agencies as proposed by the agencies in their information technology systems budget submissions.

EXHIBIT IV-9

LOCAL-AREA NETWORKS FOR MAJOR AGENCIES

DEFENSE AGENCY	NETWORK	FUNDING ($ Thousands)	FISCAL YEARS
Air Force	Local-Area Network, Headquarters AFLC	108,954	1988-1992
Air Force	Local On-line Network Systems (LONS)	18,340	1988-1992
Air Force	Initial Distributive Network for MACs Information Processing System	123,125	1988-1992
Air Force	MAC Information Systems Internetting	25,567	1988-1992
Air Force	Medical Materiel Management System On-line (MMMS-OL)	5,809	1988-1992
Air Force	Micro Computers for Cadet Dormitories and Local-Area Network (MID-LAN)	8,653	1988-1992
Army	Inspector General Network—Hardware	4,895	1988-1991
Navy	Pacific Missile Test Center—Local-Area Network (LAN)	22,155	1988-1992
Navy	Naval Aviation Depots—Local-Area Network	5,560	1988-1992
Navy	U.S. Naval Academy Data Network	5,712	1988-1992
Defense Communications Agency	Local-Area Networks and Interfaces for WIS Requirements	4,649	1989-1990
OSD	Policy Secure O/A LAN	64,204	1988-1992
OSD	OSD Secure LAN	11,620	1988-1992

Continued

EXHIBIT IV-9 (con't)

LOCAL-AREA NETWORKS FOR MAJOR AGENCIES

CIVILIAN AGENCY	NETWORK	FUNDING ($ Thousands)	FISCAL YEARS
Agriculture	Network for Headquarters and Field, Agricultural Research Service	1,500	1988-1989
Agriculture	Information and Management Network; Cooperative State Research Service	400	1988-1993
Agriculture	Distributed Processing Hardware; U.S. Forest Service	63	1988-1993
Agriculture	Automate Office Operations in National Agriculture Statistics Service Office	475	1988-1993
Agriculture	Local-Area Network for USDA Headquarters	426	1988-1993
Agriculture	Local-Area Network for USDA Headquarters, Working Capital Fund	3,890	1988-1993
Agriculture	Data Communications Network; Soil Conservation Service	1,086	1988-1993
Energy	Integrated Communications Network, Oak Ridge Complex	21,277	1988-1991
Energy	Communications Network, Sandia National Laboratory	5,375	1988-1993
Energy	Local-Area Network; Mound Facility	2,506	1988-1993
Energy	Secure Communications Network, Bettis Atomic Power Laboratory	3,677	1988-1993

Continued

EXHIBIT IV-9 (con't)

LOCAL-AREA NETWORKS FOR MAJOR AGENCIES

CIVILIAN AGENCY	NETWORK	FUNDING ($ Thousands)	FISCAL YEARS
HHS, Public Health Service	Ethernet Local-Area Networks	1,517	1988-1989
HHS, National Cancer Institute	Support for NCI Local-Area Networks	1,873	1988-1993
HHS, Social Security Administration	Field Offices Local-Area Network (LAN)	9,801	1988-1993
Interior, Bureau of Indian Affairs	ODS Local-Area Network and Telecommunications Network Management	2,300	1988-1993
Justice, Civil Division	Civil Division LANs	11,155	1988-1993
Justice, Office of Justice Programs	Office Automation Local-Area Network	1,713	1988-1993
Labor, Employment, and Training Administration	Implementation of New Office Automation Technology	4,224	1988-1991
Treasury	Secret Service Integrated Network	40,322	1988-1993
Treasury	Integrated Telecommunications Network	359,171	1988-1993
Transportation	Acquisition of LAN for Headquarters DoT	2,000	1989 only

Some agencies are using LANs in innovative and creative ways. The Department of Energy has applied LAN technology to meet its security needs. At its Idaho National Engineering Laboratory, Energy uses LAN-based video imaging technology to keep out intruders with stolen or forged identification. Equipment records visitors' pictures as they enter a building. The digitized images form a data base that is linked to a LAN file server, and through this to a verification system.

In the industry, micro-based LANs are becoming extremely popular as vendors provide increased functionality and variety. However, this was not reflected in the agency interviews. Although INPUT did not specifically ask a question on micro-based LANs, the questionnaire did include a question on supporting hardware. In practically every case, midsize hardware was specified.

This suggests that federal offices will likely start catching up with the private sector over the next few years. Therefore, any local network management offerings to the federal government should anticipate the growing popularity of micros, and act accordingly. In fact, software vendors might target their products to firms with large requirements contracts, such as Zenith and AT&T. Then, agency users could acquire their products more easily, making local network management more common.

Since the government represents, in effect, the biggest office, office systems applications would likely represent the biggest market for LANs. Given the visibility accompanying most federal offices, it is essential that information be accurate and up-to-date. This in turn requires the maximum integration of information. In a federal office, the LAN facilitates this integrity by providing users fast and efficient access to all required information. In more sophisticated office environments, LANs can sharply reduce the need for paper by circulating most information via terminal.

Early this year, GSA's Federal Office Automation Support Center (FOAC) held a conference for federal LAN experts. The participants, representing sixty federal organizations, indicated that establishing requirements and designing the network are the areas representing the biggest problems. The other areas mentioned most often included procurement, installation, and maintenance.

In terms of future plans, most expect significant growth in medium (11 to 99 workstations) and large (100 or more workstations) LANs. Further, the LANs are expected to permeate 90% of federal offices by the end of FY1989. As these LANs expand both in terms of size and penetration, the requirements for network management support will likely increase. However, since no focus has yet appeared for the types of network

management required, Contel will need to take a flexible approach, incorporating a wide, though not necessarily deep, range of products and services. Once the market crystallizes, Contel will be well positioned to respond and focus on the most promising areas.

V

Vendor Views

V

Vendor Views

A

Agency Market

The industry respondents were polled to obtain their opinions on whether a federal market exists for selected segments dealing with network management (Exhibit V-1). Nearly all the respondents (93%) were of the opinion that such a market for network management products and services does exist. Eighty-six percent held the view that there is also a federal market for technology supporting communications. Systems integration was cited as another related market segment. Only industry respondents with a small presence in the federal arena did not see the existence of a marketplace for any of these segments.

EXHIBIT V-1

VENDOR VIEWS OF EXISTING FEDERAL MARKET

Federal Market Segment	Percent of Respondents
Network Management Products/Services	93
Technology Supporting Communications	86

When asked to list the major players in the federal network management market, vendor respondents listed a wide variety of companies, as shown in Exhibit V-2. Vendors were unwilling to list many companies as controlling over 75% of the market, but did indicate many vendors who they believe control from 1% to 40% of the network management market.

EXHIBIT V-2

VENDOR VIEWS OF MAJOR PLAYERS AND MARKET SHARE

Estimated Market Share	Vendors Cited by Respondents	
1 - 10%	Boeing	UTI
	EDS*	CSC
	Martin Marietta	Timplex
	MCI*	Contel ASC
	NET	
11 - 40%	IBM	Codex
	Digital Equipment	EDS*
	GTE/Sprint	MCI*
	Racal-Milgo	
41 - 74%	BBN	
	AT&T*	
75% & Over	AT&T*	

*Mentioned in both ranges of market share.

Those industry respondents which indicated they did not plan to "prime" future federal network management bids were asked which agencies they believe represent the greatest opportunities for network management contracts in the next five years. The vendor responses are identified in Exhibit V-3. It is interesting to note that the respondents did not cite any defense agencies. This may be due to the existing defense telecommunications networks already being awarded or being bid on only by major prime contractors to the federal government. Another reason for this lack of mention might be that vendors are anticipating cutbacks in procurements from the defense agencies.

EXHIBIT V-3

VENDORS' VIEWS OF AGENCY OPPORTUNITIES FOR NETWORK MANAGEMENT CONTRACTS IN THE NEXT FIVE YEARS

Civilian Agencies	Defense Agencies
General Services Administration Veterans Administration Department of State Social Security Administration	None Mentioned

The civilian agencies which were identified included the General Services Administration, Veterans Administration, Department of State, and the Social Security Administration. These agencies have all publicly announced plans to expand or modernize their telecommunication systems. Possibly, other smaller civilian agencies may do so in the future if budgetary constraints are overcome.

In a separate study, INPUT asked vendors how they perceived the commercial market for network management.

Although network management equipment, software, and services are being sold at a large and rapidly increasing rate, the value of most of these installations in meeting the ultimate users' needs is somewhat questionable.

A number of factors are involved, many of them out of the vendors' control. The primary culprit is the unwillingness of user management to provide sufficient resources for the proper training of network management personnel in the use of the tools provided. This was discussed earlier. A common management flaw (and one not restricted to network management by any means) is a willingness to spend money on equipment and a comparable unwillingness to spend money on people.

The end result of this practice is that the capability of network management tools will continue to outstrip the capability of their users. Thus, much product functionality will remain unused. Regardless of the cause

of the problem, it will eventually affect the business of those vendors who do not provide a way around it. These ways may take many forms but are not likely to be simple.

As previously noted, there are two sets of users that are important in the network management market. One of these is the actual network manager, the one who will actually use the system or device. The second user is the network manager's manager, commonly the head of the MIS department or equivalent (as indicated by both federal and commercial surveys).

These two type of users have distinctly different views of the task of network management. Network managers believe that their staff are doing an adequate job. They also believe that, by and large, the tools they now have are adequate and that additional tools would be more trouble than they are worth. If this attitude carries over to the government, Contel may need to push the market by creating demand. Contel can do this by developing innovative products and then using public forums to emphasize their importance to agency executives.

MIS managers view the performance of network management as barely adequate and probably unable to cope with the anticipated future environment. They also see the existing network management procedures as hopelessly antiquated and labor-intensive and therefore in dire need of automation.

Most of the more advanced network management systems are being sold, at least in the private sector, to MIS managers. From the point of view of the network manager, the ultimate definition of the successful offering comes in two flavors. The first is an offering that does not create any new problems. The second is an offering that allows the network manager to demonstrate some progress with existing problems.

Network managers' comments on the proper use of vendor services are shown in Exhibit V-4.

B

Vendor Rankings

The industry respondents were asked to rank the importance of availability for selected networks or components to be managed. The respondents' ranking was based on their perspective of how the federal agencies would rank these items. The survey results are presented in Exhibit V-5.

Data networks were ranked most important followed by voice networks and LANs. Lesser importance was given to long-haul networks and T1 networking equipment. Lastly, the industry respondents did not view the availability of ISDN networks and network components as important.

EXHIBIT V-4

USE OF VENDORS

- Mostly use them for line problems
- Provide recommendations
- Assist with technical and pricing aspects
- Usually on their own products with the exception of AT&T, which usually helps across the board
- We tend not to deal with vendors unless we have to
- After we design the network—vendors are asked if their communications services can handle the load without any trouble
- Rely heavily on them. We use 4 major vendors on data and on the telephone side
- We depend on their input in some ways
- Only when we have to pending our own competency
- The least amount possible
- To provide a conceptual design
- Currently use vendors to reaffirm what we have designed—an operation system, etc.
- We need them
- Set-up, assistance, training

EXHIBIT V-5

VENDOR RANKING OF IMPORTANCE OF AVAILABILITY FOR NETWORKS/COMPONENTS

Network/Component	Rank
Data Networks	1
Voice Networks	2
Local-Area Networks	3
Long-Haul Networks	4
T1 Networking Equipment	5
ISDN Networks	6
Network Components	7

This suggests that respondents view traditional networking components as those offering the most promise. However, the LAN ranking for third is surprising, in view of the large number of LAN opportunities available (see Chapter IV C and Appendix D). The very low ranking for ISDN networks suggests that vendors expected limited funded opportunities with this technology.

In a related question, industry respondents were asked to rank how they believe the federal government would rank the importance of availability of the services. These rankings appear in Exhibit V-6. Network operation received the highest ranking by the industry representatives surveyed. It is rated higher than administration and network planning.

This reflects the widespread vendor belief that more and more agencies are contracting out their operations, reflecting significant marketing opportunities for the vendors. The low ranking for network planning suggests little interest in this area. However, the response should be viewed in relative terms. In conducting the interviews, INPUT found that most vendors were very interested in the results of our questionnaire, even though relatively few showed a willingness to fill it out.

EXHIBIT V-6

VENDOR RANKING OF IMPORTANCE OF AVAILABILITY FOR SELECTED SERVICES

Service	Rank
Network Operations	1
Administration	2
Network Planning	3

Exhibit V-7 identifies the rankings given by the industry respondents for the key evaluation criteria for network management jobs. As shown in the exhibit, vendors considered price as the number one selection criteria used by federal agencies. This stems from the industry's recognition of the budgetary constraints imposed on the government.

EXHIBIT V-7

VENDOR RANKING OF KEY EVALUATION CRITERIA FOR NETWORK MANAGEMENT JOBS

Criteria	Rank
Price	1
Network Management Features	2
Product Capabilities	3
Operational Support and Services	4

Network management feature and product capabilities were ranked second and third respectively. These two criteria focus on the proposed technical solutions offered by the vendors, rather than the lowest priced

bid. Operational support and services was viewed as the least important criteria used by the government in evaluation of network management contracts.

This has several implications for Contel, as it proceeds into the federal network management market. First, on competitive bids, price is usually the most important factor, despite what agency respondents say. Second, features and products are viewed as more important than services. Thus, Contel will need to offer a full suite of capabilities in order to penetrate this market.

C

Vendor Activities

Nearly two-thirds of the industry respondents have current federal contracts that include network management services as shown in Exhibit V-8. Exhibit V-9 lists both the civilian and defense agencies that awarded contracts for network management to those vendors responding to our survey. The list includes many of the large departments and selected agencies which are actively procuring the information technology and services needed to expand and modernize their computer operations.

The vendors were also surveyed as to the method used by the federal government to acquire network management services from contractors (see Exhibit V-10). Seventy-eight percent indicated that they acquired the agency contract as an additional requirement in a telecommunications equipment, software, or complete systems acquisition. Twenty-two percent of the industry respondents have obtained their contracts as a follow-on to current telecommunication equipment contracts. The same percentage received contracts from other methods which included packet switched networks and network management contracts. The smallest percent (11%) were awarded as original projects for the management of existing telecommunication systems.

This is consistent with both the agency surveys (discussed in Chapter 3) and the procurement data (discussed in Chapter 6). Relatively few contracts are awarded purely for network management. These needs are usually bundled with other products and services. This suggests that Contel may need to develop teaming arrangements, either internal or external, to market network management to the government.

As noted earlier, few network management products address any or only a narrow range of network problem areas. Almost every vendor of network equipment has some form of network management system for its product line.

These systems, now being termed "element management systems," have been available for many years from modem vendors. They have recently become available from PBX and from multiplexor (MUX) vendors and they are now starting to become available from the carriers.

EXHIBIT V-8

VENDORS WITH CURRENT FEDERAL CONTRACTS INCLUDING NETWORK MANAGEMENT

Response	Percent of Respondents
Yes	64
No	36

EXHIBIT V-9

AGENCIES AWARDING VENDORS CONTRACTS INCLUDING NETWORK MANAGEMENT

Civilian Agencies	Defense Agencies
Department of Energy	Army
Department of Labor	Navy
Department of Education	Defense Communications Agency
Department of Transportation	
Department of Health and Human Services	Defense Intelligence Agency
Department of Interior	
National Aeronautics and Space Administration	
Environmental Protection Agency	
U.S. Postal Service	

EXHIBIT V-10

FEDERAL METHODS FOR ACQUIRING SERVICES

Method	Percent of Responses*
Follow-on to Current Telecom Equipment Contract	22
Follow-on to Current Telecom Software Contract	0
Original Project, for Management of Existing Telecom System	11
Additional Requirement in a Telecommunications Equipment, Software, or Complete System Buy	78
Other	22

*Does not add to 100% due to multiple responses.

These element management systems allow the user to obtain monitoring and other status information from all of the elements within that system. They also allow some frequently significant measure of control of these elements.

However, these element management systems do not talk to each other. They only talk to the elements of that particular vendor's product line. This is entirely understandable because these systems were designed in order to enhance the salability of each vendor's products.

The problem that this presents to users is well understood by vendors. Now that vendors must concede that multivendor systems are here to stay, most vendors are working hard to make their systems compatible with as broad a range of other element management systems as possible.

- Penetration level—The offerings with the greatest penetration level of user installations are those associated with the mainframe computer, most notably IBM's Netview and its predecessors. This is primarily attributable to the "purchase solution" mindset of senior MIS management that is responsible for network management.

- What products are needed—There are two general areas of product need identified in this study. The first is an increasing level of vendor support, including but not limited to on-site personnel. The second is simpler products to manage possibly self-diagnosing, but not necessarily self-correcting products.

Vendor Support

Vendor support has always been needed on all types of products. In telecommunications, with products inherently distributed over a wide geography, vendor support is absolutely essential. However, vendors disputed this need in Exhibit V-7, discussed above. This need becomes dramatically apparent with carrier services, where users are looking not just for good quality services but also for the carriers to tell them how well these services are operating. Many users are looking for on-site personnel to be able to handle some of the more technical tasks of managing their networks.

Simpler Products

Simpler products are needed because there is little likelihood that users will spend much more time on training. The products that will be used will be those products that require little training. This conclusion is in conflict with the current high rate with which sophisticated network management systems are being purchased, at least in the commercial sector. However, users are reaching a point at which the resulting lack of use of equipment will backlash on vendors.

Smaller users in particular are looking for assistance in a world that has greatly outgrown their ability to manage their networks. It is in the small-user market that the expansion of telecommunications applications is being held back by the users' concern for potential network management problems. Larger users are able to absorb the new capabilities and the rapid growth in their own networks.

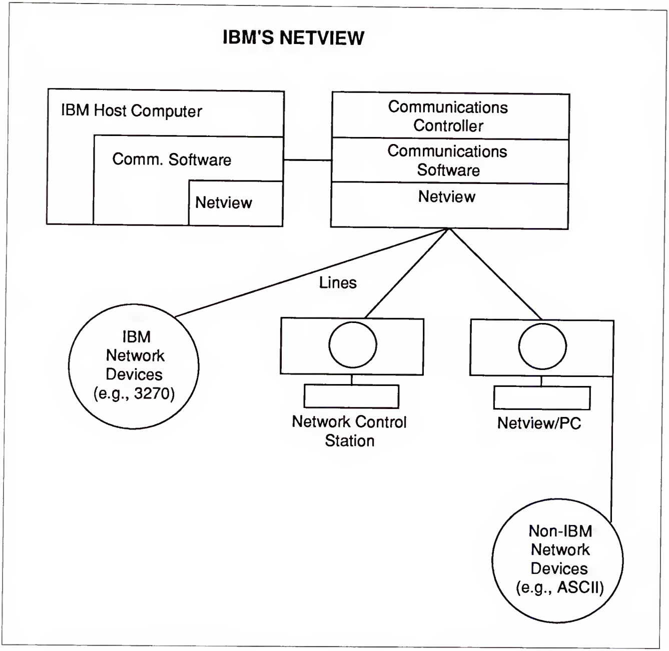
In the area of multivendor systems there has been little real progress, especially among the users who are unable to do much programming of their own. There appears to be an attitude of resignation on the part of such users.

This situation may be changing. However, it is changing less in the nature of the products and their ability to intercommunicate than in the attitude of vendors that are removing long-standing barriers to multivendor support. The most notable of these changes are IBM's recent announcement of its willingness to maintain multivendor systems and AT&T's provision of on-site network management personnel to its customers.

More recently, many announcements have been directed toward interconnection with other vendors' network management systems. The most notable and successful has been IBM's Netview.

Netview is a collection of IBM's various network management packages, including NCCCF, NPDA, and NPM. Netview/PC is IBM's interface to other vendors' network management systems. Netview/PC is primarily a data collection and protocol converter and display mechanism. An outline of Netview is shown in Exhibit V-11.

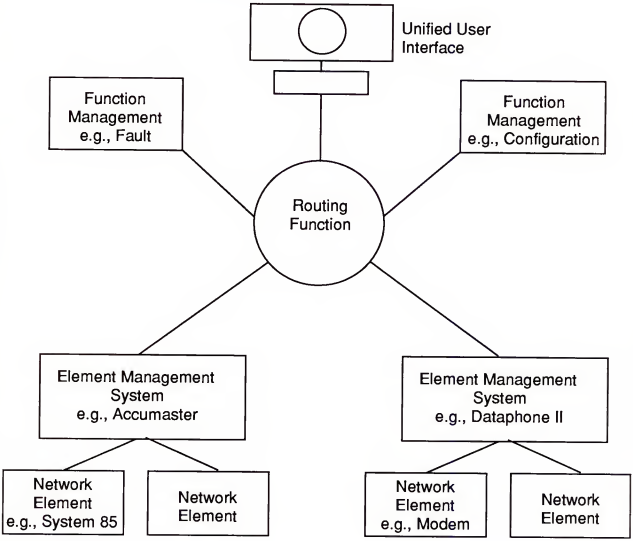
EXHIBIT V-11



Unified Network Management Architecture (UNMA) is AT&T's version of a network management system. It is more of an architecture than a product in the same sense that SNA is an architecture. UNMA is illustrated in Exhibit V-12.

EXHIBIT V-12

AT&T'S UNIFIED NETWORK MANAGEMENT ARCHITECTURE


Unified User Interface
Function Management e.g., Fault
Function Management e.g., Configuration
Routing Function
Element Management System e.g., Accumaster
Element Management System e.g., Dataphone II
Network Element e.g., System 85
Network Element
Network Element e.g., Modem
Network Element

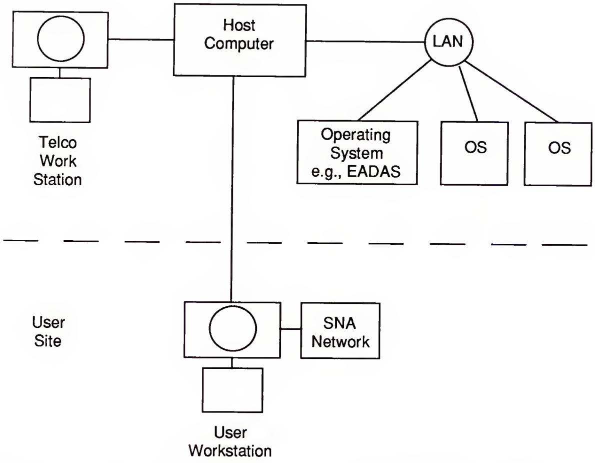
One of the key features of UNMA is the segregation of network management functions into individual systems, each of which manages a defined set of network elements such as modems, switches, etc. UNMA ties all of these, both carrier systems as well as customer premises equipment

(CPE), into a single presentation. Many of these systems already exist, such as Accumaster for AT&T's PBXs and Dataphone II for AT&T's modems. This integration of existing products into a single NMS provides vendors with wide product lines such as those of AT&T and IBM with a significant running start on a major user requirement.

Net Partner is another AT&T system contained with 3B600 computers in a telephone company central office. It allows users to gain controlled access to the operations systems of the telco. These operations systems include EADAS (Engineering Administrative Data Acquisition System), SCCS (Switching Control Center System), LMOS (Loop Maintenance Operations System), and others. Access to these operations systems allow users to obtain information on the transmission portion of their network directly from the systems that monitor those facilities, rather than through a human interpreter of end-of-the-month reports. Net Partner is illustrated in Exhibit V-13.

EXHIBIT V-13

AT&T'S NET PARTNER



Other vendors such as DEC and HP have introduced systems aimed at the network management market with similar objectives.

Probably the major problem facing all network users is the reality of a multivendor environment. Few of the existing network management systems, including Netview and UNMA mentioned earlier, have real multivendor capabilities. For example, Netview/PC, IBM's multivendor interface, depends on the other vendors delivering data in an IBM-defined format for presentation. Although this is obviously an improvement over multiple displays, the correction of problems is still the responsibility of the individual systems.

D

Vendor Offerings

In their network management contracts with the federal government, vendor respondents indicated that they supply a wide range of products and services. These findings are listed in Exhibit V-14. All vendor respondents supply network planning services and network management software of some type on their federal contracts. Nearly all of the respondents also supply network operations services, user training services, and network management equipment. Maintenance services were supplied by the fewest vendors surveyed. Items supplied by vendors in the "other" category include full services value-added networks and administrative support services like billing and call accounting.

EXHIBIT V-14

SERVICES PROVIDED BY VENDORS IN CURRENT FEDERAL NETWORK MANAGEMENT CONTRACTS

Type of Service	Percent of Responses*
Network Operations Services	89
Network Planning Services	100
User Training	89
Network Management Software	100
Network Management Equipment	89
Maintenance Services	78
Other Products or Services	11

*Does not add to 100% due to multiple responses.

The majority of companies surveyed indicated that they supply both telecommunications and datacommunications services to the federal government, as shown in Exhibit V-15. These services include systems training, network planning services, disaster recovery, network operations, and various network management services. The next highest number of respondents supply datacomm products, ranging from front-end processors, package assembler/disassemblers (PADs), and packet-switches to file servers, disk servers, and even network planning packages. Other products included items such as electronic bulletin boards, E-mail systems, and configuration management packages.

EXHIBIT V-15

TELECOMMUNICATION/ DATACOMMUNICATION PRODUCTS AND SERVICES OFFERED BY VENDORS

Product/Service	Percent of Respondents
Datacom Products	64
Telecom Products	43
Telecom and Datacom Services	86
Other Products	29

As shown in Exhibit V-16, the sizes of vendor organizations dedicated to supplying the services mentioned above varied somewhat. Most of the respondents indicated that staffs of over 525 people were used to support these products and services. The next most common staffing size was in the 25 to 125 person range. No vendor respondents had staffs of under 25. These findings indicate that for vendors that are in the network management marketplace, a dedicated staff of over 500 people is not uncommon. Staffs of this size enable superior product support and represent great strengths in bidding federal contracts.

EXHIBIT V-16

NUMBER OF EMPLOYEES IN VENDOR ORGANIZATION

Range	Percent of Respondents
Under 25	0
25 - 125	23
126 - 225	8
226 - 325	0
326 - 425	0
426 - 525	0
Over 525	69

E

Vendor Plans

INPUT asked the industry respondents whether they planned to "prime" on future federal network management jobs. As shown in exhibit V-17, 79% of the vendors surveyed indicated that they did plan to bid as prime contractors for future network management opportunities. Considering that the majority of the respondents support staffs of over 500 people, this response is not surprising.

When planning to bid as primes on contracts, respondent vendors also plan to acquire a number of products and services from subcontractors. Exhibit V-18 shows that 70% of the industry respondents plan to acquire other network management equipment and software from subcontractors. Vendors will also use subcontractors for supplying operations and maintenance services. Although most of the vendor respondents were large, full-service telecom or datacom providers, each had shortcomings in their product mix.

EXHIBIT V-17

VENDOR PLANS TO "PRIME" FUTURE FEDERAL NETWORK MANAGEMENT BIDS

Response	Percent of Respondents
Yes	79
No	21

EXHIBIT V-18

SERVICES OR PRODUCTS VENDORS PLAN TO ACQUIRE FROM SUBCONTRACTORS

Service/Product	Percent of Respondents
Equipment	70
Maintenance	40
Software	70
Operations	60

VI

Technical Support Services Market Analysis

VI

Technical Support Services Market Analysis

INPUT has analyzed the telecommunications technical support market. In general, this market covers various professional services in support of telecommunications activities, and includes, but is not limited to network management services. Specifically, the technical support services market includes the following Federal Supply Codes:

- M127 Operation of Government Communication System Facilities
- Y127 Construction of Government Communication System Facilities
- Z127 Maintenance, Repair, and Alteration of Government Communication System Facilities
- R304 ADP Services/Data Transmission
- R426 Professional Services Communication Services
- R553 Studies-Communications

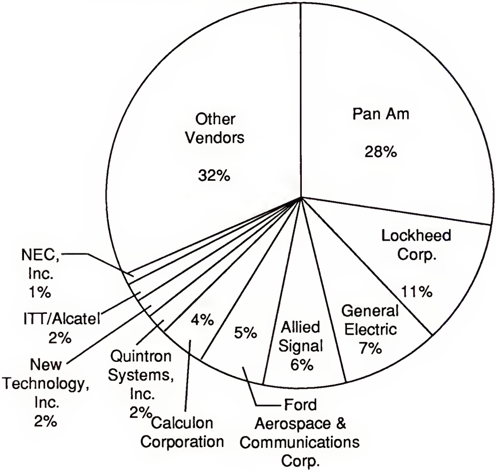
INPUT separated the available contract data into single and bundled forms. The single category includes contracts that cover only the FSCs listed above. The bundled category includes contracts for virtually anything. However, at least one item from the above list of FSCs must be represented in each contract. In this market, the bundled category is the most useful for Contel in planning network management strategies and assessing the competition. The pure category provides information about vendors who offer more of the technical aspects of the telecommunications technical support services. The bundled category includes contracts which involve combined purchases of technical support services and communications or computing equipment. These types of contracts are more likely to include network management services.

For the combined Federal Government obligations for fiscal years 1984 through 1987, the top ten vendors for the single technical support market are listed in Exhibit VI-1. INPUT was not able to determine how Pan Am came to dominate this market, although it has several subsidiaries pursuing federal business. Further research showed 114 contracts won by Pan Am, all in the formal solicitation mode. The other nine vendors provide no real surprises.

EXHIBIT VI-1

LEADING VENDORS

TELECOMMUNICATIONS TECHNICAL SUPPORT, SINGLE



Total Market Value: $2.055 Billion

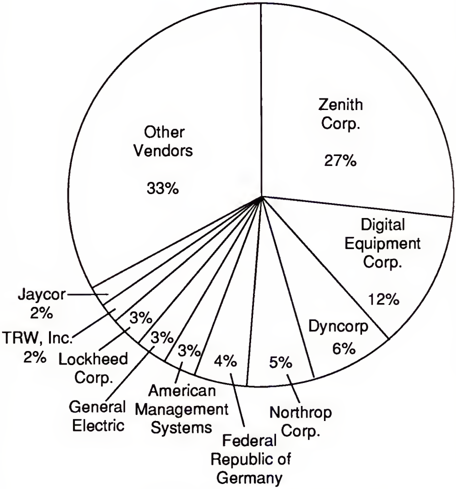
Together, the top 10 cover 68% of the market, indicating a very heavy concentration among a relatively small number of firms. After the 21st vendor, no other vendor receives as much as one half of 1% of the total. In fact, even IBM, offering its SNA family of products, finished at 115, with $972 thousand in 1984 and nothing since. The top 10 vendors in this segment do not include companies known for their network management services or products. They offer only limited services in the subject areas.

The bundled area (Exhibit VI-2) shows the top ten vendors in the bundled technical services market. These vendors receive 67% of the available dollars, indicating a heavy concentration of contract awards in the top ranking companies. Most of the companies listed here offer significantly more network management products and services than in the single segment. Contel may not consider itself in competition with Dyncorp or Northrop, and certainly not with the Federal Republic of Germany. However, as the exhibit shows, these organizations are receiving major contracts within the bundled technical support categories.

EXHIBIT VI-2

LEADING VENDORS

TELECOMMUNICATIONS TECHNICAL SUPPORT, BUNDLED



Total Market Value: $1.567 Billion

In the technical support market, the vendor's success rate varies widely, at least for the most part. Exhibit VI-3 shows consistent business levels for Pan Am but not for the other two. In fact, Lockheed, despite its second place ranking, received no business at all in FY1987.

EXHIBIT VI-3

RANKINGS OF THE TOP THREE VENDORS FROM FY 1984-1987

TELECOMMUNICATIONS TECHNICAL SUPPORT, SINGLE

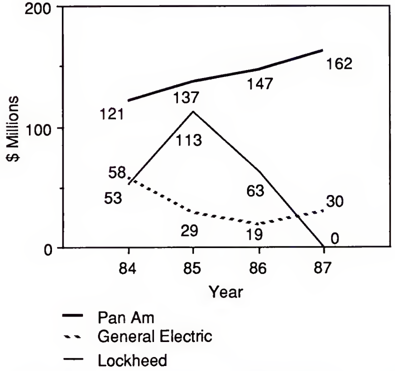


Exhibit VI-4 shows that both Zenith and Digital received no business in FY1984 and 1985. However, they both did extremely well in the next two years. Zenith's success in the federal market relates mainly to its PC sales.

The next two exhibits compare the relative rankings in the single versus bundled segments. As is apparent in Exhibit VI-5, five of the top ten vendors in the single category do not even appear in the bundled category. Only Lockheed and General Electric appear in the top ten in both categories.

EXHIBIT VI-4

RANKINGS OF THE TOP THREE VENDORS FROM FY 1984-1987

TELECOMMUNICATIONS TECHNICAL SUPPORT, BUNDLED

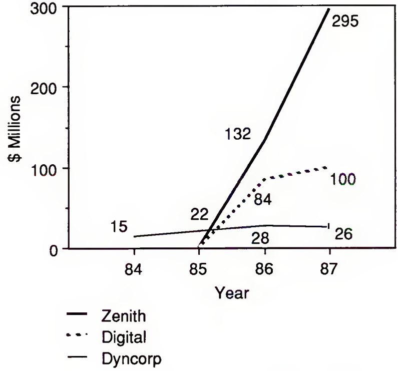


Exhibit VI-6 shows that six of the top ten in the bundled category do not show up in the single category. The strength of such companies as Zenith and Digital indicates their success at winning other kinds of business, which includes telecommunications technical support. This represents a successful area for these companies, and does not imply that they should change anything.

The sharp differences between the categories is also reflected in the next two exhibits. Exhibit VI-7 shows that, except for Pan Am, each of the top five vendors had some success in the bundled market. However, Exhibit VI-8 shows just the opposite. The top five vendors in the bundled market received virtually no business in the single market. This lack of business again reflects the fact that these firms (and Germany) are not in the telecommunications technical support business. Rather, the companies do other things, which very often include technical support. If Contel is to pursue this market, it will likely need to team with other firms, offering other products and services.

EXHIBIT VI-5

TOP 10 VENDOR RANKINGS, REVENUES, AND MARKET SHARES

TELECOMMUNICATIONS
TECHNICAL SUPPORT, SINGLE

Company Name and Ranking		Rank in Bundled	Revenues in Market Segment ($K)	Percent Share in Market Segment
1.	Pan Am	*	566,941	28
2.	Lockheed	8	229,373	11
3.	General Electric	7	136,485	7
4.	Allied Signal	17	120,649	6
5.	Ford Aerospace	19	101,187	5
6.	Calculon	*	72,718	4
7.	Quintron Systems	*	33,973	2
8.	New Technology	*	32,673	2
9.	ITT/Alcatel	*	32,249	2
10.	NEC	72	30,595	1

*Not in Top 130

EXHIBIT VI-6

TOP 10 VENDOR RANKINGS, REVENUES, AND MARKET SHARES

TELECOMMUNICATIONS
TECHNICAL SUPPORT, BUNDLED

Company Name and Ranking	Rank in Single	Revenues in Market Segment ($K)	Percent Share in Market Segment
1. Zenith	*	427,571	27
2. Digital Equipment Corp.	*	183,039	12
3. Dynacorp	14	91,626	6
4. Northrop	*	80,573	5
5. Federal Republic of Germany	97	57,773	4
6. AMS	*	54,405	3
7. General Electric	3	46,437	3
8. Lockheed	2	44,935	3
9. TRW	*	30,923	2
10. Jaycor	*	28,927	2

*Not in Top 130

EXHIBIT VI-7

TOP FIVE VENDORS' REVENUES IN SINGLE VS. BUNDLED MARKETS

TELECOMMUNICATIONS TECHNICAL SUPPORT, SINGLE

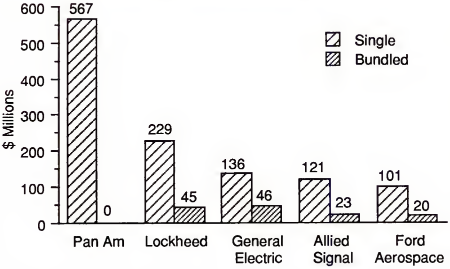


EXHIBIT VI-8

TOP FIVE VENDORS' REVENUES IN SINGLE VS. BUNDLED MARKETS

TELECOMMUNICATIONS TECHNICAL SUPPORT, BUNDLED

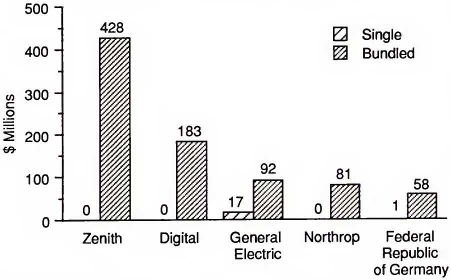
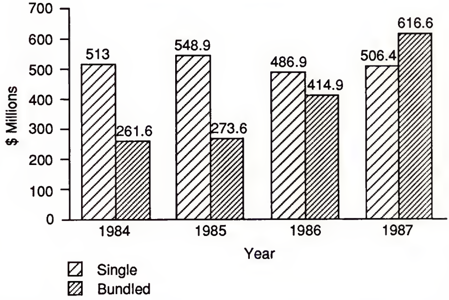


Exhibit VI-9 compares the total market segment for the single versus bundled categories. Although the single category dominates at the beginning, it is eventually overtaken by the bundled contracts. However, both categories consistently provide high revenue levels. As mentioned earlier in this section, the technical support market serves as an indicator for the network management services market. The increasing obligations in the bundled category of this market represent potentially growing opportunities for Contel's network management products and services.

EXHIBIT VI-9

RELATIVE TOTAL MARKET SEGMENT VALUES SINGLE VS. BUNDLED, BY FISCAL YEAR, 1984-1987

TELECOMMUNICATIONS TECHNICAL SUPPORT



The federal government may enter into procurement contracts through a variety of contracting methods. INPUT has divided these methods into four classifications: OTP/GSA contracts, GSA schedule contracting, formal solicitations, and all "other" methods. Other methods include negotiated non-competitive contracts, directed procurements for foreign governments, and tariff or regulated acquisitions.

- OTP/GSA contracts include contract actions through the now-defunct "Office Technology Plus" stores, sponsored by the GSA. These stores provided one-stop office technology shopping for federal managers.

- GSA Federal Supply Schedule contracts cover multiple order contracts established by GSA, that allow federal officials to purchase products and services from a listing of qualified vendors' available products and services.

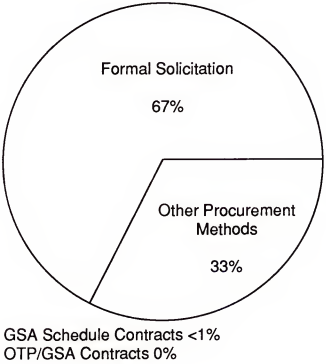
- Formal solicitations involve the process of requests for proposals, multiple vendor bids, evaluation of bids, and final contract award.

Exhibit VI-10 shows how the telecommunications technical support market is divided among the procurement types outlined above. The GSA schedule contracts and the OTP/GSA contracts provide virtually no revenues to this category. It may be encouraging to top players like Zenith and Digital that two-thirds of the awards are made through the formal solicitation route. This pattern indicates that significant opportunities are available in this market.

EXHIBIT VI-10

PERCENTAGE OF TOTAL "MARKET SEGMENT" PRODUCT PURCHASES BY PROCUREMENT METHOD

TELECOMMUNICATIONS TECHNICAL SUPPORT



According to many vendors, the network management market is still relatively ill-defined, and accurately estimating competitors' market shares is nearly impossible. Vendor respondents had difficulty ranking large systems integrators like EDS, BCS, and CSC because these companies generate revenues from numerous sources relating to telecommunications in general, but not from network management specifically. Value-added network vendors and communications service providers were also difficult to rank.

VII

Conclusions and Recommendations

VII

Conclusions and Recommendations

The federal market for network management products and services is ambiguous, volatile, and not easily sized. Many agencies have a wide variety of networks and network management needs. However, the large number of network marketing opportunities represents a more significant factor for Contel's planning.

As more local and wide area networks are introduced into agency environments, demand for network management services must necessarily increase. Further, as has been shown in numerous studies, the federal customer is growing steadily more sophisticated and demanding. This too, will lead to steady market growth.

However, agency interviews did not show a highly focused set of requirements. Respondents know that they need help, but they are not sure what form that assistance should take. Accordingly, Contel must first develop or acquire high quality products or services. Then Contel should lead the federal market through journal articles, public forums, and other marketing approaches. Where Contel already has an agency presence, it can sell the new products and services to its customers.

Contel needs to adopt a three-pronged approach in building network management business:

- Develop a wide variety of products and services to facilitate flexible reaction to changing federal needs
- Initiate a marketing, as opposed to sales, program to create demand among federal customers
- Identify appropriate teaming partners

For upcoming bids, Contel may need to establish good teaming relationships in order to assume technical proposal leadership. This stems from three factors:

- The multivendor characteristics of most federal installations dictate a wide range of technical features and disciplines. Since Contel will probably lack the internal technical capability to handle them all, it will need specialized contractors.
- With Congressman John Conyers of Michigan assuming control of the House Government Operations Committee, INPUT expects an increase in solicitations aimed at small and disadvantaged businesses. To the extent that Contel can effectively subcontract to these 8(a) primes, it can greatly expand its agency penetration, leading to bigger contracts later on.
- Most network management opportunities will come in bundled solicitations, as defined in Chapter VI. Network management work will be embedded in much larger contracts, covering a wide variety of products and services. Therefore, Contel will require teaming partners to meet all of the government needs.

In addition, INPUT offers the following observations and recommendations:

- INPUT's interviews with agency executives showed little uniformity of buying plans or key application areas. Accordingly, it would probably be a mistake, at least at this point, to focus on only one or two aspects of network management.
- An agency's level of network management requirements depends directly on its level of network sophistication. The more an agency has, the more it wants. Therefore, as already stated, Contel must offer a wide variety of products and services in order to accommodate widely varying agency needs. While small agencies may represent excellent marketing opportunities, their low level of sophistication may require more intense marketing efforts than Contel is prepared to commit.
- In other studies, INPUT identified a small but growing demand for electronic data interchange (EDI) in the government. This EDI growth will heighten communication needs, and thereby network management requirements.
- Because of budget constraints and OMB pressure, agencies will gradually increase their acquisition of off-the-shelf systems. While the "Not-Invented-Here (NIH)" attitude has prevailed in the past, this is now

changing, although more slowly than OMB would like. Accordingly, improved functionality in network management products, either through internal development or teaming, will directly increase Contel's market penetration.

- Standards compliance will continue to grow in the government. To the extent that Contel's products support government standards, they will be more readily accepted.
- The vendor interviews, as well as, to some extent, the non-interviews suggest growing interest and competition in this market. Whenever Contel pursues a federal opportunity, Contel should expect a dozen competitors pursuing that same opportunity.

In conclusion, INPUT determined that federal network management will continue to be a highly complex, demanding, but growing market. Numerous opportunities exist, whereby relatively small network management efforts can lead to large, comprehensive, telecommunications technical support contracts. The obstacles cited above, if not properly addressed, may preclude Contel from playing a leadership role in this market. Contel needs to take the appropriate steps in marketing, teaming, and product development in order to advance to a dominant position.

A

Appendix: Interview Profiles

A

Appendix: Interview Profiles

A

Federal Agency Respondent Profile

1. Contact Summary

INPUT contacted federal agencies by telephone and through the mail. Initial agency contact was made over the phone, and questionnaires were sent to those federal officials who agreed to participate in the study.

For this report, the distribution of job classification among individual agency respondents included the following:

- Datacom and Telecom Section Head
- Branch Chief
- Communication Management Specialist
- LAN/WAN Management Specialist

Federal officials in these positions covered diverse responsibilities, such as policy makers, buyers, and users. In general, Information Resource Management officials did not have sufficient knowledge to respond to the survey. Instead, they passed the surveys on to subordinates who were able to answer most of the questions.

2. List of Agencies

Respondents to the network management study questionnaires represented each of the agencies listed below. The number in parentheses indicates the total number of completed surveys within each agency.

Civilian Agencies

- Agriculture	(5)
- Commerce	(4)
- Energy	(1)
- Government Printing Office	(1)
- Interior	(3)

- National Science Foundation	(1)
- Tennessee Valley Authority	(1)
- U.S. Information Agency	(1)

Defense Agencies

- Air Force	(1)
- Defense Logistics Agency	(1)
- Office of the Secretary of Defense	(1)

In generating these questionnaire responses, INPUT attempted to contact 197 federal officials. Of these attempted contacts, INPUT actually spoke with 132 officials, and sent 54 questionnaires. Twenty questionnaires were completed, either over the phone or received through the mail.

B

Vendor Respondent Profile

The telecommunications and data communications vendors interviewed for this study represent a diversified selection of companies conducting business in the federal government. Respondent vendors offered the government telecommunications products and services ranging from discrete telecom and datacom components (i.e. modems, PADs, and multiplexors), to leased communications lines, and full-service value-added networks. In many cases, a single vendor may supply a wide range of telecom and datacom products and services.

Respondent vendors for this study represented the following five business areas:

Telecom/datacom equipment vendors	(5)
Systems integrators	(4)
Regional Bell operating companies (RBOCs)	(3)
Common carriers	(3)
Value-added network (VAN) providers	(1)

For this report, the variety of completed interview types were divided as follows:

Marketing	(11)
Technical	(3)
Executive	(2)

The distribution of titles among vendor respondents included the following job classifications:

- Manager, Marketing
- Manager, Business Development, or Strategic Planning
- Vice President
- Director

In generating vendor questionnaire responses, INPUT attempted to contact 94 vendors of telecommunications, datacommunications, and network management products and services. INPUT eventually spoke with 79 vendor executives, and sent 30 questionnaires. Sixteen vendors filled out the questionnaire, but only 14 responded before the data tabulation had been completed.

INPUT initially contacted all vendor respondents by telephone, and mailed questionnaires to those vendors who chose to participate. Completed questionnaires were received through the mail, by facsimile transmission, or through subsequent telephone interview.

Most vendors who declined to participate cited one of the following objections:

- Suspicion of our motives
- Unwillingness to discuss company resources or attitudes
- Inability to locate qualified respondents
- Unwillingness to take the time to respond

B

Appendix: Network Management—Agency Questionnaire

B

Appendix: Network Management—Agency Questionnaire

For the purposes of this survey, we are using the following definitions:

Bandwidth - Range of transmission frequencies that can be carried on a communications path; used as a measure of capacity.

Dedicated Circuit - A permanently established network connection between two or more stations.

Ethernet - Local-area network developed by Xerox using baseband signaling, Carrier Sense Multiple Access/Collision Detect protocol, and coaxial cable to achieve a 10 mbps data rate.

Front-End Processor (FEP) - Communications controller such as the IBM 3725 or COMTEN 3690 used to interface communications lines to host computers.

Leased Line - Permanent connection between two network stations; may be either a dedicated or switched line.

Local-Area Network (LAN) - Limited-access network between computing resources in a relatively small (but not necessarily contiguous) area, such as a building, complex of buildings, or buildings distributed within a small metropolitan area.

Modem - A device that encodes information into electronically transmittable form (MOdulator) and restores it to original analog form (DEModulator).

Network Management - The planning for, operation of, and administration of local and wide-area networks that consist of voice and/or data products.

Private Automated Branch Exchange (PABX) - Hardware and software that provide automatic local circuit switching on a customer's premises.

Private Network - A network established for one user of user organization.

Public Network - A network established and operated for more than one user with shared access, usually available on a subscription basis.

Systems Network Architecture (SNA) - Three-layer communications architecture designed by IBM, with the layer functions roughly corresponding to the seven-layer OSI model.

T1 - Bell System designation for 1.544 mbps carrier capable of handling 24 PCM voice channels.

Value-Added Network (VAN) - Communication network that provides service beyond simple transmission capacity—such as computerized switching, multiple-terminal access, line sharing, or error checking and control.

Wide-Area Network (WAN) - Limited access network between computing resources in buildings, complexes of buildings, or buildings within a large metropolitan or geographical area.

CONFIDENTIAL NETWORK MANAGEMENT MARKET RESEARCH
AGENCY QUESTIONNAIRE

INPUT QUESTIONNAIRE

INTERVIEWER:____________________ DATE:________________

STUDY TITLE: Network Management Market Research

TYPE OF INTERVIEW: ___TECHNICAL ___TELEPHONE
___POLICY ___ON-SITE
___USER ___MAIL

AGENCY/SERVICE:____________________ ADDRESS:

DEPARTMENT/
DIRECTORATE:____________________

BRANCH:____________________ ____________________

OFFICE:____________________ ____________________

OFFICE CODE:____________________ ____________________

NAME:____________________ TITLE:________________

TELEPHONE NUMBER:____________________________________

SUMMARY:____

____

____

____

REFERRALS:____

____

____

QU: 1 Do you have some knowledge and understanding of the data processing networking systems in your agency:

____Yes ____No (If No, who might we contact?)

Questions 2 - 12 concern Wide-Area Networks (WANs)

QU: 2 What kinds of host computers, and approximately how many units, do you use to support your network(s)? (Please mark all that apply.)

	Host Computer	**Quantity**
IBM	_____	_____
Unisys	_____	_____
Digital	_____	_____
Honeywell	_____	_____
Other (please specify)		
____________________	_____	_____
____________________	_____	_____
____________________	_____	_____

QU: 3 How many terminals are connected to a host in each of the following manners?

____Locally ____Remotely ____Both

Other ____

QU: 3a If remotely connected, which approaches are used? (Please mark all that apply.)

____Leased (____Dedicated ____Switched)

____Dial Up ____Value-Added Network

Other ____

QU: 4 Which, if any, dedicated data networks do you use, and how many lines are there in each? (Please mark all that apply.)

	Network(s) Used	**Number of Lines**
IBM SNA	____	____
Sperry UNISCOPE	____	____
Burroughs Poll Select	____	____
Honeywell VIP	____	____
Digital Equipment Corp. DECNet	____	____
Other (Please Specify Below)	____	____

____

____

QU: 5 What percentage of the terminals access a dedicated host? ________%

QU: 6 What types of data communications equipment are used? (Please mark all that apply.)

	Vendor(s)
Multiplexor	________________
Modem	________________
T1	________________
Other (Please Specify)	
____________________	________________
____________________	________________
____________________	________________

QU: 7 How is network security executed? What vendors supply the necessary equipment? (Please mark all that apply.)

	Vendor
Vendor-Provided Security Package	____________________
Encryption Device	____________________
Dial-back Unit	____________________
Other (Please Specify)	
____________________	____________________

QU: 8 What kind of Network Control Center is used and what vendor(s) supply these? (If more than one, please mark all that apply.)

	Vendor
IBM Netview	____________________
Modem Control Systems	____________________
T1 Control Systems	____________________
Other (Please Specify)	
____________________	____________________

QU: 9 Rank the level of importance of the following network management system features, (1 for highest; 2 for second, etc.)

Single-terminal control of entire integrated network	_____
Graphics display of network configuration status	_____
Expert system diagnostic tools for solving common network problems	_____
Natural language user interface	_____
Network management utilities, such as service order processing, trouble processing, or inventory control	_____
Other features______________________________	_____

QU: 10 Concerning Network Support:

	In-house	**Single-Vendor**	**Multiple-Vendors**
Who operates the network?	_____	_____	_____
Who services the network?	_____	_____	_____

QU: 11 What upgrades, if any, are planned? (Please mark all that you are considering.)

T1 Backbone _____
Packet-Switched _____
FTS 2000 _____
ISDN Local Switch _____
None Planned _____
Other (Please Specify) ____

QU: 12 Organizationally, who controls your network(s) for fiscal year 1989?

Data Processing Organization _____
Separate Telecommunications Organization _____
User Organization _____
Other (Please Specify) ____

Questions 13 - 18 concern Local-Area Networks (LANs)

QU: 13 Do you have any LANs in your organization?

____Yes ____No (If No, close interview.)

QU: 14 What are the characteristics of your LAN(s)? Please indicate how many of your LANs conform to each appropriate LAN characteristic. Please also indicate the data speed for each LAN. (Please mark all that apply.)

	Number of LANs	**Data Speed for ea. LAN**
Protocols		
IEEE 802.3 - Ethernet	_____	_____
IEEE 802.4 - Token Bus	_____	_____
IEEE 802.5 - Token Ring	_____	_____
Don't Know	_____	_____
Others (Please list below.)		

____

QU: 14 (Continued)

Topology
Bus _____ _____
Ring _____ _____
Star _____ _____
Don't Know _____ _____
Mixed (Please describe below.)
____

Cabling
Coaxial Cable _____ _____
Twisted Pair _____ _____
RS-232 _____ _____
RS-449 _____ _____
Fiber Optic Cabling _____ _____
Don't Know _____ _____
Other (Please list below.)
____

QU: 15 Which vendor(s) do you use for your LAN hardware and software? For LAN management functions?

Hardware ______________________________
Software ______________________________
LAN Management System ______________________________

QU: 16 Are your LAN(s) interconnected:
To other LANs? _____
To Wide-Area Networks (WANs) _____

QU: 16a If not interconnected, do you have plans for such a connection?

____Yes ____No
If Yes, when? ______________________________

QU: 17 Do you have a requirement for a LAN design tool?

____Yes ____No

QU: 18 If yes, what features should it incorporate? (Please mark all that apply.)

Modeling and Simulation _____
Logical Topology _____
Physical Cabling Design _____
Cost Estimate Modeling _____
Other (Please explain below.) _____
____
____

Would you be interested in participating in follow-on meetings concerning network management?

____Yes ____No

Thank you for your assistance with this difficult survey.

C

Appendix: Network Management—Vendor Questionnaire

C

Appendix: Network Management—Vendor Questionnaire

For the purposes of this survey, we are using the following definitions:

Bandwidth - Range of transmission frequencies that can be carried on a communications path; used as a measure of capacity.

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Modem - A device that encodes information into electronically transmittable form (MOdulator) and restores it to original analog form (DEModulator).

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T1 - Bell System designation for 1.544 mbps carrier capable of handling 24 PCM voice channels.

Value-Added Network (VAN) - Communication network that provides service beyond simple transmission capacity—such as computerized switching, multiple-terminal access, line sharing or error checking and control.

Wide-Area Network (WAN) - Limited access network between computing resources in buildings, complexes of buildings, or buildings within a large metropolitan or geographical area.

CONFIDENTIAL NETWORK MANAGEMENT MARKET RESEARCH VENDOR QUESTIONNAIRE

INPUT QUESTIONNAIRE

INTERVIEWER:________________________ DATE:__________________

STUDY TITLE: Network Management Market Research

TYPE OF INTERVIEW: ___TECHNICAL ___TELEPHONE
___MARKETING ___ON-SITE
___EXECUTIVE ___MAIL

COMPANY/DIV.:________________________ ADDRESS:

SUBSIDIARY:________________________ ________________________

BRANCH:________________________ ________________________

OFFICE:________________________ ________________________

OFFICE CODE:________________________ ________________________

NAME:________________________ TITLE:__________________

TELEPHONE NUMBER:____

SUMMARY:____

____

____

____

REFERRALS:____

____

____

QU: 1 Does a federal market exist, in your opinion, for any of the following? (Please mark all that apply.)

Network Management Products/Services _____
Technology Supporting Communications _____
Other Market (Please Specify)
_______________________________ _____
No Market Exists _____

QU: 1a If the answer is "No Market" above, *why not*, and *in how many years* might there be a viable federal network management services, technology or other market?

____

____

QU: 2 How do you believe the federal government would rank the importance of availability of the following networks or components to be managed? (Rank the list of items; indicate 1 for highest, 2 for second, 3 for third, etc.)

Rank

Voice Networks _____
Data Networks _____
Long-Haul Networks _____
T1 Networking Equipment _____
Local-Area Networks _____
ISDN Networks _____
Network Components (MODEMs, MUXs) _____
Other (Please Specify Below) _____
____

QU: 2a How do you believe the federal government would rank the importance of availability of the following services? (Rank the list of items; indicate 1 for highest, 2 for second, 3 for third, etc.)

Rank

Network Operations _____
Administration (Inventory, Billing, etc.) _____
Network Planning _____
Other (Please Specify Below) _____
____

QU: 3 What vendors do you believe are the major players in the Federal Network Management market? Please estimate the percentage of the federal market that you believe they control.

Specify Vendors	Indicate Market Share
______________________	______%
______________________	______%
______________________	______%
______________________	______%

(Please list any other vendors and market shares below.)

____

____

QU: 4 Does your company have any current federal contracts that include network management services?

____Yes ____No (If No, go to Question 8.)

QU: 5 With what agency or agencies do you have contract(s)?

____

____

QU: 6 In winning these jobs, how did the federal government acquire the services? (Please mark all that apply.)

Follow-on to Current Telecom Equipment Contract	_____
Follow-on to Current Telecom Software Contract	_____
Original Project, for Management of Existing Telecom System	_____
Additional Requirement in a Telecommunications Equipment, Software, or Complete System Buy	_____
Other (Please describe below.)	

____

____

QU: 7 In your current federal network management contracts, do you provide: (Please mark all that apply.)

	Yes	**No**
Network Operations Services	_____	_____
Network Planning Services	_____	_____
User Training	_____	_____
Network Management Software	_____	_____
Network Management Equipment	_____	_____
Maintenance Services	_____	_____
Other Products or Services (list below):		

____

____

QU: 8 How do you believe federal government agencies would rank these key evaluation criteria for network management jobs? (Rank the list of items; indicate 1 for highest, 2 for second, 3 for third, etc.)

	Rank
Network Management Features	_____
Product Capability	_____
Price	_____
Operational Support/Services	_____
Other (Please specify below.)	

____

____

QU: 9 What Telecom/Datacom products and services does your company offer? (Please check all that apply for each category.)

Datacom Products:
____Network Planning Package
____Front-End Processors
____Packet-Switches
____Network Analyzers
____PADs
____File Servers
____Disk Servers
____LAN Gateways, Bridges
____Multiplexors
____Security Equipment

Telecom Products:
____Telemanagement Package
____PBX Equipment
____Key Systems
____Automated Call Attendants
____Call-Accounting Systems
____Voice Messaging Systems

Other Products:
____Facsimile Machines
____Teleconferencing Systems

Services:
____Telecom/Datacom Systems Training
____Network Planning Consulting
____Network Management
____Monitoring
____Diagnosing
____Bypassing Faults

QU: 9 (Con't)

Services:

____Capacity Management
____Network Maintenance
____Network Disaster Recovery
____Network Operations
____Value-Added Networks (VANs)
____Other (Please indicate.) ____
____
____

QU: 9a Approximately how many people in your organization are dedicated to these products or services? (Check one.)

____Under 25
____25 - 125
____126 - 225
____226 - 325
____326 - 425
____426 - 525
____Over 525

QU: 10 Do you plan to “Prime” future federal network management bids? (Check one.)

____Yes (Continue to question 11.)

____No (Go to question 12.)

QU: 11 (If yes to question 10) What services or products will you acquire from subcontractors? (Please mark all that apply.)

____Equipment
____Maintenance
____Software
____Operations
____Other

QU: 12 (If no to question 10) What agencies do you believe represent (or will eventually represent) the greatest opportunities for network management contracts in the next five years?

____

____

Thank you for your valuable assistance.

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Appendix: Network Management Opportunities by Agency

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Appendix: Network Management Opportunities by Agency

This section identifies specific network management opportunities in the federal information technology market. Lists of programs are provided for future telecommunications and related services. The opportunities list consists of major programs that are typical of the federal market and serves as a representative sample.

Agency/Program	PAR Reference	RFP Schedule	Funding FY89-93 ($M)	Network Type
Air Force				
Project 6000	V-1-2	Unk	Unk	LANs
Air Force WWMCCS Information System (AFWIS)	V-1-27	1QFY90	176.2	LANs
Joint WIS (JWIS)	V-1-32	1QFY90	296.0	LANs
Air Force Technical Order Management Systems (AFTOMS)	V-1-53	3QFY90	28.7	LANs
Army				
Army World Wide Military Command and Control System (WWMCCS) Information System (AWIS)	V-2-8	1QFY90	288.3	LANs
Corp of Engineers Automation Plan, Objective 1. (CEAP-1)	V-2-9	Unk	10.3	WANs

Agency/Program	PAR Reference	RFP Schedule	Funding FY89-93 ($M)	Network Type
Army				
Reserve Component Automation System (RCAS)	V-2-34	8/89	203.9	LANs WANs
Integrated Procurement System (IPS)	V-2-36	1QFY89	26.8	LANs
Navy				
Computer-Aided Acquisition and Logistics Support (CALS)	V-3-80	Unk	Unk	LANs WANs
Uniform Automated Data Processing Systems for Stock Points (UADPS-SP)	V-3-82	Unk (RFQs)	18.9	LANs
Navy World-Wide Military Command and Control System (WWMCCS) Information System (NWIS)	V-3-83	1QFY90	79.6	LANs
Defense Logistics Agency				
Logistics System Modernization Program (LSMP)	V-4A-9	12/88 RFI	196.4	LANs
Department of Defense				
Computer-Aided Acquisition and Logistics Support (CALS)	V-4A-14	Unk	Unk	LANs WANs
Office of the Secretary of Defense				
DoDDS Management Information Systems	V-4F-1	2QFY89	3.4	WANs

Agency/Program	PAR Reference	RFP Schedule	Funding FY89-93 ($M)	Network Type
Agriculture				
Departmental Data Communications Network (DEPNET)	VI-5-28	7/90	1.8	WANs
LOCAL - Area Network	VI-5-33	Unk	$200,00 (real value)	LANs
Commerce				
Advanced Weather Interactive Processing System (AWIPS)	VI-6-24	2QFY89	126.7	LANs
Energy				
Network Upgrade	VI-7-31	Unk	4.8	WANs
Health and Human Services				
Toxicology Data Management System (TDMS)	VII-8-30	1/89	22.0	LANs
Computer Based Training	VII-8-28	Unk	9.3	WANs
Medicare Catastrophic Protection Network	VII-8-38	4QFY89	100.0	WANs
Interior				
ADP Equipment Modernization Project	VII-9-8	6/89	29.7	WANs
Automated Land and Mineral Record System (ALMRS)	VII-9-11	6/89	150.0	WANs

Agency/Program	PAR Reference	RFP Schedule	Funding FY89-93 ($M)	Network Type
Labor				
ERISA Electronic Data Base	VII-9A-2	Unk	43.6	WANs
Black Lung Automated Support System Facilities Management (Recompetition)	VII-9A-3	10/88	47.5	WANs
Integrated Management Information System (IMIS)	VII-9A-5	Unk	Unk	LANs
Wide-Area Data Network	VII-9A-6	11/88	40.0	WANs
Justice				
Computer Applications Communications Network (CACN)	VII-10-9	Unk	157.5	LANs WANs
Antitrust Office Automation	VII-10-17	Unk	9.0	LANs
Standard Industries Systems	VII-10-19	2QFY89	Unk	WANs
National Crime Information Center	VII-10-24	Unk	20.0	WANs
Treasury				
Integrated Telecommunications Network (ITN)	VII-12-32	Unk	302.5	WANs
Integrated Collection System	VII-12-33	1QFY89	268.4	WANs
Automation Commercial System (ACS)	VII-12-57	Unk	213.9	WANs

Agency/Program	PAR Reference	RFP Schedule	Funding FY89-93 ($M)	Network Type
General Services Administration				
Information Processing and Data Communications for the 1990s (IPDC-90)	VIII-14-5	Unk	56.5	LANs
Veterans Administration				
DVB Modernization	VIII-16-11	FY91	87.5	LANs WANs